(23,480)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1914.

No. 89.

FIREBALL GAS TANK & ILLUMINATING COMPANY AND DAVID LEON SOLOMAN, PETITIONERS,

vs.

COMMERCIAL ACETYLENE COMPANY AND THE PREST-O-LITE COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE EIGHTH CIRCUIT.

INDEX.

	Original.	Print
Caption	a	1
Transcript from United States district court for the eastern district of Missouri	1	1
Citation and acceptance of service	1	2
Bill of complaint	2	2
Recital of filing of separate answers	8	7
Replication to answer of Fireball Gas Tank & Illuminating Co.	8	7
Replication to answer of David L. Soloman	8	8
Order to show cause why preliminary injunction should not issue, etc.	9	8
Affidavits for complainants in support of prayer for preliminary injunction	9	9
Affidavit of Theodore du Moulin	10	9
Receipted bill of Fireball Gas Tank & Illuminating Co.	11	10

Judd & Detweiler (Inc.), Printers, Washington, D. C., April 21, 1915.

	Original.	Print
Contract of du Moulin	12	11
Receipt of Adams Express Co. to Theo. du Moulin for gas tank	13	11
Affidavit of Theodore W. Smith	15	12
Affidavit of Oramel H. Skinner	20	16
Recital of filing of return of defendants to order to show cause	22	18
Defendants' record on motion for preliminary injunction	23	18
Affidavit of Percy B. Hill	24	18
Edward N. Dickerson	52	42
Julius J. Suckert	53	42
Defendants' Exhibit 1—Drawing of Prest-O-Lite tank	75	61
Defendants' Exhibit 2—Drawing of defendants' tank	76	61
Defendants' Exhibit—Copy of second Suckert affidavit	77	62
Defendants' Exhibit—Print of drawing in second Suckert affidavit	79	63
Affidavit of William B. Potter	80	64
Royce A. Ruess	129	104
Edward N. Dickerson	155	126
Julius J. Suckert	156	126
Calvin M. Woodward	166	135
Herman W. Born	172	140
Angelo Rosso	184	149
Alfred Ramel	186	150
William M. Lohse	188	151
Orville Sprecher	190	153
George G. Little	195	157
August Seim	198	159
Henry P. Deming	202	161
Clarence De Witt Lukens	205	164
Defendants' Exhibit Drawing of Nitrous Oxide Gas Tank	219	175
Defendants' Exhibit Sectional Drawing of Seltzer Bottle Valve	220	175
Affidavit of David Leon Soloman	221	176
Lee Meriwether	223	177
Harry S. Sanderson	225	178
James H. Smith	227	180
O. C. Raines	229	181
William Phillips Thompson	231	182
Separate answer of Fireball Gas Tank & Illuminating Co.	233	183
Separate answer of David Leon Soloman	243	191
Return of respondents on order to show cause	253	199
Defendants' Exhibit 28—German letters patent to Claude and Hess, No. 97,953, August 27, 1896	257	202
Defendants' Exhibit 33—Translation of German patent to Claude and Hess, No. 97,953	263	208

	Original.	Print
Defendants' Exhibit 26*a*—Drawing, addition to Claude and Hess French patent No. 257,679	269	207
Defendants' Exhibit 26*b*—Drawing, addition to Claude and Hess French patent No. 257,679	270	207
Affidavit of William B. Potter	271	208
Dr. Herman H. Born	274	211
Clarence De Witt Lukens	275	211
Defendants' Exhibit du Moulin Contract	279	215
Affidavit of Joseph S. Soloman	280	216
Defendants' Exhibit Letter to Joe Soloman, October 20, '11	282	217
Motion of defendants to strike certain affidavits for complainants from files	282	217
Order overruling motion of defendants to strike certain affidavits for complainants from files	283	218
Order granting leave to file exhibits and affidavits and deferring hearing on order to show cause	283	218
Defendants' exhibits	283	219
Recitals as to 1 and 2	283	219
3—Certified extract from publication "Acetylene: The Principles of its Generation and Use," by Leeds and Butterfield, London, 1903	283	219
Statement, solubility of acetyline in various liquids.	285	220
4—Certified copy of extract from French publication "Annales de Chimie et de Physique," with translation	287	222
5—Certified extract from "Journal of the Franklin Institute," published in May, 1895	288	223
Article entitled "The Carbides and Acetylene Commercially Considered"	289	223
Figure 6, showing saucer containing mercury with portion of solidified gas	294	228
Figures 1, 2, 3, 4, 5, and 7, showing acetylene in its physical conditions, etc	295	229
Figure 8, drawing of furnace in which carbide of calcium is produced	297	231
Letter, Kelvin to Thomas L. Willson, October 3, 1892	299	233
Statement, details of cost of producing calcium carbide as a by-product in the manufacture of fire and pressed brick	301	234
Figure 9, apparatus for the manufacture of acetylene from calcium carbide	305	237
Figure 10, drawing showing gas burning which is produced from liquefied acetylene	306	237
6—Certified copy of specifications forming part of letters patent to Edward N. Dickerson, No. 662,258, November 20, 1900	308	239
7—File-wrapper and contents of letters patent to Edward N. Dickerson, No. 662,258, November 20, 1900	311	240
Certificate of Assistant Commissioner of Patents	311	240

	Original.	Print
List of filings, etc	311	240
Petition of applicant	312	241
Specification	313	241
Oath of applicant	314	243
Memorandum of completion of application of E. N. Dickerson	315	243
Communication from examiner, May 10, 1897	315	243
Letter to Commissioner enclosing associate power of attorney, May 17, 1897	316	244
Letter to Commissioner appointing associate attorneys	317	245
Communication from examiner, June 22, 1897	317	245
Amendment of June 18, 1897	317	246
Communication from examiner, August 2, 1897	318	246
Affidavit of E. N. Dickerson	319	247
Affidavit of Julius J. Suckert	320	248
Communication from examiner, March 12, 1898, holding affidavits insufficient	320	248
Amendment of July 22, 1898	321	249
Communication from examiner, August 16, 1898	322	250
List of filings on appeal	322	250
Notice of allowance of patent, October 30, 1900	323	251
Memorandum of fee paid at Patent Office	324	252
Specification forming part of letters patent No. 662,258, November 20, 1900, to E. N. Dickerson	325	253
List of contents	326	254
8—Certified copy of letters patent No. 582,274, to E. N. Dickerson *et al.*, May 11, 1897	327	255
9—File-wrapper and contents of abandoned application of Claude and Hess, No. 625,581	333	257
Certificate of Assistant Commissioner of Patents	333	257
Figure 1, drawing of tank	334	258
List of filings	334	258
Petition of applicants	335	259
Specification	336	259
Oath of applicants	341	263
Communication of examiner, April 6, 1897	342	264
Amendment of July 7, 1897	343	264
Communication of examiner, July 19, 1897	344	266
Amendment of September 15, 1897	345	266
Communication of examiner, November 2, 1897	347	268
List of filings on appeal	347	269
Associate power of attorney	348	269
Communication of examiner, June 26, 1899	348	270
Amendment of September 15, 1899	349	270
Letter to Commissioner of Patents, September 15, 1899	351	272
Communication of examiner, September 28, 1899	352	273
Letter to Commissioner of Patents, October 24, 1899	352	273
Communication of examiner, November 4, 1899	353	274

	Original.	Print
Letter to Commissioner of Patents, December 12, 1910	354	275
Certified copy of order to hold cause open, Commercial Acetylene Co. *et al. vs.* Auto Acetylene Light Co. *et al.*	354	275
List of contents	355	276
10—File-wrapper and contents on appeal to examiners-in-chief, etc., *In re* application of Claude and Hess, No. 625,581	356	277
Certificate of Assistant Commissioner of Patents	356	277
Petition for appeal	357	278
Examiner's statement	358	279
Notice of hearing	360	281
Decision of examiners-in-chief	361	281
Renewal of former appeal, second appeal	363	283
Examiner's statement	364	284
Notice of hearing on second appeal	365	285
Brief on second appeal	366	286
Decision of examiners-in-chief on second appeal	373	291
List of contents	375	293
11—File-wrapper and contents on appeal to Commissioner of Patents *In re* application of Claude and Hess, No. 625,581	375	293
Certificate of Assistant Commissioner of Patents	376	294
Petition for appeal	376	294
Notice of hearing	377	295
Notice of postponement of hearing	378	296
Brief on appeal	378	296
Decision of Acting Commissioner	381	299
Notice of affirmance of decision of examiners-in-chief	383	301
List of contents	384	301
12—Certified extract from "A Dictionary of Chemistry, by Henry Watts, B. A.," etc	385	302
13—Certified extract from "Dictionnaire de Chimie Pure et Appliquée, par Ad. Wurtz," with translation	386	302
14—Certified extract from "A Treatise on Beverages, or The Complete Practical Bottler," by C. H. Sulz	389	305
15—Certified extract from "A Treatise on Beverages, or The Complete Practical Bottler," by C. H. Sulz	392	308
16—Certified extract from "A Treatise on Chemistry, by H. E. Roscoe," F. R. S., *et al.*	393	309
Figure 35, towers shown in vertical section	394	309
Figure 142, apparatus employed by French chemists	395	310
17—Certified copy of letters patent to Albert Stearns, No. 224,240, February 3, 1880	396	311

	Original.	Print
18—Certified copy of German letters patent to George Webb, No. 58,927, December 5, 1890, with translation	390	312
19—Certified copy of letters patent to Robert Munn Dixon, assignor, etc., No. 567,764, September 15, 1896	410	320
20—Certified copy of British letters patent to Ernest George Gearing, No. 22,183, November 16, 1894	417	321
21—Certified copy of letters patent to Saunders and Patton, No. 394,018, December 4, 1888	422	324
22—Certified copy of British letters patent to Charles Denton Abel, No. 9901, July 14, 1887	427	325
23—Certified copy of letters patent to A. H. J. Schulke, No. 577,989, March 2, 1897	434	330
24—Letters patent to E. Hill, No. 261,607, July 25, 1882.	442	331
25—Certified copy of provisional and complete specifications of British letters patent to Claude and Hess, No. 29,750, March 15, 1898	445	332
26—Certified copy of specifications forming part of French letters patent to Claude and Hess, No. 257,679, June 30, 1896, with translation	452	338
Certified copy of certificate of addition to patent No. 257,679, March 20, 1897, with translation	458	343
Certified copy of certificate of addition to patent No. 257,679, October 15, 1897, with translation	461	346
26-A—Official copy of certificate of addition concerning French letters patent to Claude and Hess, No. 257,679, June 11, 1897	465	350
26-B—Official copy of certificate of addition concerning French letters patent to Claude and Hess, No. 257,679, April 25, 1898	472	356
27—Certificate of expiration of English patent to Claude and Hess, No. 29,750	476	359
28—Recital as to	478	360
29—Certified extract from "Report of the Sixth Meeting of the British Association for the Advancement of Science"	478	360
30—Certified extract from "First Outlines of a Dictionary of Solubilities of Chemical Substances by Storer"	479	361
31—Certified extract from "Hand-book of Chemistry by Gmelin"	480	362
32—File-wrapper and contents of letters patent to Dickerson and Suckert, No. 582,274, May 11, 1897	481	363
Certificate of Acting Commissioner of Patents	481	363
List of filings	482	364
Petition of applicants	483	364
Specification	483	365
Oath of applicants	486	367
Communication of examiner, April 7, 1896	487	368

	Original.	Print
Associate power of attorney	488	369
Drawing forming part of letters patent to Dickerson and Suckert, No. 582,274, May 11, 1897	488	369
Amendment of October 3, 1896	489	369
Communication of examiner, November 3, 1896	490	371
Amendment of November 23, 1896	491	372
Communication of examiner, December 29, 1896	493	374
Amendment of January 12, 1897	494	374
Communication of examiner, February 12, 1897	494	375
Amendment of February 27, 1897	495	376
Notice of allowance of patent, April 2, 1897	496	377
Memorandum of fee paid at Patent Office	497	377
Letters patent to Dickerson and Suckert, No. 582,274, May 11, 1897	498	378
List of contents	498	379
33—Memorandum as to	499	379
34—Certified copy of letters patent to Edmond Fouche,		
35—Certified copy specifications forming part of German letters patent to Dr. H. Loesner, No. 82,437, assignor, etc., No. 727,609, May 12, 1903	499	380
December 13, 1894, with translation	503	381
36—Certified extract from "L'Incandescence par le Gaz & le Petrole," by F. Dommer, with translation	506	384
38—Memorandum as to	509	386
37—Certified extract from "Commercial Organic Analysis, by Alfred H. Allen"	509	387
39—File-wrapper and contents of letters patent to Claude and Hess, No. 664,383, December 25, 1900.	509	387
Certificate of Acting Commissioner	510	387
List of filings, etc	510	388
Petition of applicants	511	388
Specification	511	389
Oath of applicants	518	393
Communication of examiner, April 6, 1897	518	393
Amendment of July 7, 1897	519	394
Communication of examiner, August 23, 1897	521	396
Amendment of September 15, 1897	522	397
Communication of examiner, October 22, 1897	525	400
Letter to Commissioner of Patents, November 1, 1897	526	401
Communication of examiner, December 16, 1897	527	402
Amendment of April 3, 1899	528	403
Communication of examiner, April 15, 1899	529	404
List of filings on appeal	530	405
Associate power of attorney	530	405
Amendment of September 13, 1899	531	406
Letter to Commissioner of Patents, September 13, 1899	532	407
Communication of examiner, September 28, 1899	533	408
Letter to Commissioner of Patents, October 24, 1899	534	409

	Original.	Print
Communication of examiner, November 4, 1899...	535	410
Communication of examiner, November 24, 1899...	536	410
Ruling on examiner in charge to file answer exhibiting reasons why amendment of September 13, 1899, should not be granted.....	536	411
Petition to Commissioner to direct examiner to enter amendment of September 13, 1899.....	537	411
Notice of hearing on petition from action of primary examiner	538	413
Examiner's statement	539	413
Notice of postponement of hearing.....	543	417
Brief for petitioners.....	543	417
Notice of Commissioner's decision.....	547	420
Commissioner's decision	548	420
Amendment of January 18, 1900.....	549	422
Letter to Commissioner of Patents, January 18, 1900	551	423
Communication of examiner, January 23, 1900....	552	424
Amendment of June 11, 1900.....	553	425
Notice of allowance of patent, June 16, 1900.....	553	425
Memorandum of fee paid at Patent Office.....	555	427
Letters patent to Claude and Hess, No. 664,383, December 25, 1900.....	555	427
List of contents.....	559	428
Memorandum of clerk as to physical exhibits.....	560	429
Memorandum as to Defendants' Exhibit Sectional Drawing of Seltzer Bottle Valve.....	560	429
Memorandum as to Defendants' Exhibit Nitrous Oxide Tank	560	429
Memorandum as to Defendants' Exhibit Drawing of Nitrous Oxide Tank.....	561	429
Memorandum as to Defendants' Exhibits Sample of Acetone and Terpeline.....	561	430
Defendants' Exhibit Certified Copy of Defendants' Patent No. 987,000, March 14, 1911.....	561	430
Defendants' Exhibit "Fireball Pamphlet".....	567	430
Defendants' Exhibit "Prest-O-Lite Circular".....	575	431
Defendants' Exhibit Extract from "Scientific American," May 6, 1911.....	577	433
Memorandum as to Defendants' Exhibits Second Suckert Affidavit and Print of Drawing in Second Suckert Affidavit	581	436
Memorandum as to Defendants' Exhibit Sectional Fireball Yoke	581	436
Affidavits for complainants.....	581	436
Affidavit of Oramel H. Skinner.....	581	436
Frederick W. Russe.....	584	439
Theodore W. Smith.....	587	442
Francis B. Gallagher.....	588	442

	Original.	Print
Exhibit A—Report of Arthur D. Little, Inc., to Keyes Winter on contents of fireball gas tank No. 979, September 6, 1911	589	443
Result of observations made during four days when tank was being discharged	591	445
Photographs taken at intervals on first day of discharge of gas from tank	596	449
Hearing on application for injunction deferred	597	450
Submission of application for injunction	597	450
Order awarding temporary injunction, January 22, 1912	598	450
Record entry of filing of petition for rehearing and approval of bond	598	451
Petition for rehearing	599	451
Bond upon temporary injunction	599	452
Answer to defendants' petition for rehearing	600	453
Reply to answer to petition for rehearing	602	454
Withdrawal of petition for rehearing	603	455
Order allowing appeal and granting supersedeas, etc	603	455
Assignment of errors	604	456
Petition for appeal	608	459
Supersedeas bond	608	460
Præcipe for transcript	609	461
Clerk's certificate to transcript	611	462
Appearance of counsel for appellants	612	462
Appearance of counsel for appellees	612	463
Order of argument	613	463
Order of submission	614	464
Opinion of United States circuit court of appeals	615	465
Decree of United States circuit court of appeals	624	472
Petition of appellants for a rehearing	625	473
Order denying petition for rehearing	646	490
Motion for stay of mandate	646	491
Order granting motion for stay of mandate, etc	647	492
Clerk's certificate to transcript	649	492
Stipulation as to return to writ of certiorari	650	493
Writ of certiorari	651	494
Clerk's return to writ of certiorari	653	494

a Pleas and proceedings in the United States Circuit Court of Appeals for the Eighth Circuit, at the September Term, 1912, of said Court, before the Honorable Walter H. Sanborn and the Honorable William C. Hook, Circuit Judges, and the Honorable Charles A. Willard, District Judge.

Attest:

[Seal United States Circuit Court of Appeals, Eighth Circuit.]

JOHN D. JORDAN,
Clerk of the United States Circuit Court of Appeals for the Eighth Circuit.

Be it Remembered that heretofore, to-wit: on the fifth day of March, A. D. 1912, a transcript of record, pursuant to an appeal allowed by the District Court of the United States for the Eastern District of Missouri, was filed in the office of the Clerk of the United States Circuit Court of Appeals for the Eighth Circuit, in a certain cause wherein the Fireball Gas Tank & Illuminating Company and David L. Soloman are Appellants, and the Commercial Acetylene Company and The Prest-O-Lite Company are Appellees, which said transcript as prepared and printed under the rules of the United States Circuit Court of Appeals for the Eighth Circuit, under the supervision of its Clerk, is in the words and figures following, to-wit:

1 *Citation.*

The United States of America to Commercial Acetylene Company and The Prest-O-Lite Company, Greeting:

You are hereby cited and admonished to be and appear in the United States Circuit Court of Appeals, Eighth Circuit, at St. Louis, Missouri, sixty days from and after the day this Citation bears date, pursuant to an appeal filed in the Clerk's office of the District Court of the United States for the Eastern Division of the Eastern Judicial District of Missouri, wherein Fireball Gas Tank & Illuminating Company and David L. Soloman are appellants, and you are appellees, to show cause, if any there be, why the order issued against the said appellants as in said appeal mentioned should not be corrected, and why speedy justice should not be done the parties in that behalf.

Witness, the Honorable —— ——, Judge of the District Court of the United States for the Eastern District of Missouri, this 15th day of February, in the year of our Lord one thousand nine hundred and twelve.

SMITH McPHERSON,
United States District Judge for the Eastern District of Missouri.

Service accepted.

FORDYCE, HOLLIDAY & WHITE,
WINTER & WINTER,
Solicitors for Complainants.

Filed in the District Court on Feb. 15, 1912.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern
Judicial District of Missouri, ss:

Be It Remembered, That heretofore, to-wit: on the 17th day of August A. D. 1911, there was filed in the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri a bill of complaint in chancery, which said bill of complaint is in words and figures, as follows, to-wit:

2 (*Bill of Complaint.*)

United States Circuit Court for the Eastern District of Missouri.

No. —. In Equity.

THE COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
against
THE FIREBALL GAS TANK AND ILLUMINATING COMPANY and DAVID L. SOLOMAN, Defendants.

To the Honorable the Judges of the Circuit Court of the United States for the Eastern District of Missouri:

The Commercial Acetylene Company, a corporation organized and existing pursuant to the laws of the State of New Jersey, and located at Harrison in said State of New Jersey, and a citizen of said State, and The Prest-O-Lite Company, a corporation organized and existing pursuant to the laws of the State of Indiana, and located at Indianapolis in said State, and a citizen of Indiana, now present this their bill of complaint against the Fire Ball Gas Tank and Illuminating Company, a corporation organized and existing pursuant to the laws of the State of Missouri, and David L. Soloman, both citizens and residents of the City of St. Louis, in the State and Eastern Division of the Eastern District of Missouri and having committed the acts of infringement hereinafter complained of in said State and Eastern District of Missouri.

And thereupon your orators complain and say:

First. That theretofore and before the first day of March, 1897, George Marie Auguste Claude, residing in St. Mande and George Albert Hess, residing at Paris, France, citizens of the Republic of France, being the true, joint, original and first inventors and discoverers of an improved apparatus for storing and distributing

acetylene gas fully described in the United States Letters Patent hereinafter mentioned, not known or used by others in this country before their invention or discovery thereof, and not patented or described in any printed publication in this or any foreign country before their invention or discovery thereof, or more than two years prior to their application for Letters Patent therefor in this country, as hereinafter set forth, and which had not been in public use or on sale in this country for more than two years prior to their said application, and which had not been abandoned and which invention or improvement had not been first patented or caused to be patented by the said inventors or their legal representatives or assigns or either of them in a foreign country upon application filed more than seven months prior to the filing of said application
3 in this country, made application for Letters Patent of the United States [*of the United States*] in accordance with the then existing laws of the country.

Second. And your orators further show unto your Honors that having complied in all respects with the conditions and requirements of the laws of the United States and with the rules and regulations of the Patent Office of the United States, thereafter, and on the 25th day of December, 1900, Letters Patent of the United States No. 664,383 signed, sealed and executed in due form of law and bearing the date of the day and year last aforesaid, were granted unto Bruno Abdank Abakanowicz of Parc St. Maur, France, as assignee of said Claude and Hess as by the certified copy of said Letters Patent in Court to be produced will more fully and at large appear.

And your orators further show that by virtue of certain mesne assignments in writing and duly recorded in the United States Patent Office, your orator, The Commercial Acetylene Company, became on the 3d day of June, 1901, the owner of the entire right, title and interest in and to said Letters Patent No. 664,383, and in and to the invention and improvements set forth therein, whereby your orator, The Commercial Acetylene Company became, always since has been and is now entitled to the exclusive right of making, using and vending such invention and improvements throughout the United States and territories thereof, except as hereinafter set forth, as by said assignments in Court to be produced will more fully and at large appear.

Third. And your orators further show unto your Honors that by virtue of the premises your orator, The Commercial Acetylene Company, became, and ever since has been, and now is the sole and exclusive owner of all right, title and interest in and to said Letters Patent No. 664,383, and in and to the invention and improvements therein described and claimed and of all the rights described in said Letters Patent and each of them, except as hereinafter set forth.

Fourth. That thereafter, and before the commission by the defendants of the acts hereinafter complained of, your orator, The Prest-O-Lite Company, entered into a written agreement with your orator, The Commercial Acetylene Company, whereby your orator,

The Prest-O-Lite Company, became, has ever since been and is now possessed of and vested with the exclusive right, liberty and license to manufacture, use and sell throughout the United States and the Territories thereof, apparatus employing and containing the invention covered by said Letters Patent to be used on automobiles,
carriages and other movable vehicles. That the right, liberty
4 and license so vested in your orator, The Prest-O-Lite Company, is exclusive as to all of said apparatus embodied in the said invention to be used on automobiles, carriages and other movable vehicles.

Fifth. That thereafter and at all times hereinafter mentioned, and after the said exclusive license was granted to your orator, The Prest-O-Lite Company, your orator, The Prest-O-Lite Company, has continuously engaged in manufacturing devices and structures embodied in the said Letters Patent for use upon automobiles, carriages and other movable vehicles. That for this purpose and in order to make the said invention profitable to itself and to the public your orator has invested large sums of money and has established numerous plants and offices throughout the country for the conduct of its said business, as hereinafter set forth. That your orator since October, 1904, has manufactured and sold great numbers of the said devices and structures embodied in the said Letters Patent, to-wit, about 500,000 and that upon each and every one of them your orator, The Prest-O-Lite Company, has marked the tradename "Prest-O-Lite" by which the said article is generally known to the public and the trade. That the said invention and improvements have been and now are of great benefit and advantage to the public, and have gone into extensive use and sale for the furnishing of acetylene for lighting of cars, boats, buoys and for heat in welding apparatus and the like, and your orators have been and now are able to meet the demand for apparatuses containing and embodying the invention disclosed in said patents, and that the public has generally acknowledged and acquiesced in the rights of your orators.

Sixth. And your orator further shows unto your Honors, that said inventions and each of them have been and are of great benefit and advantage and that the public have generally acknowledged and acquiesced in the aforesaid rights of your Orator, and that your orator would, but for the unlawful acts and doings of the defendant hereinafter mentioned, and others acting in concert with it, have made large gains, profits, and advantages in the manufacture and sale of the said inventions and improvements and apparatus embodying the same, but that your orator has been prevented and hindered from making such gains, profits and advantages as it might have made but for the said unlawful acts and doings, and that your orator would, but for the said unlawful acts and doings now be able to use with profit and advantage the inventions and improvements thus patented as aforesaid, to the exclusive use of which it is entitled as aforesaid, but which, by reason
of said unlawful acts and doings of said defendant, and
5 others acting in concert with it, your orator is now prevented and hindered from so doing, and your orator be-

lieves that it will realize large gains and profits from said inventions and improvements and each of them if the infringement of said Letters Patent Nos. 664,383 aforesaid, by the defendant and its confederates shall be prevented.

Seventh. And your orator further shows unto your Honors, that it has notified said defendant and the public generally of the aforesaid Letters patent, and each of them, and of the exclusive rights conferred upon your orator by reason thereof, said notice having been given in conformity with the requirements of the statute in such cases made and provided, to-wit: by affixing to each and every one of the said patented apparatus the word "Patented" together with the day and year *of* each of said letters patent were granted, and that it has warned and requested the defendant to desist from its unlawful manufacture, use and sale of articles containing the aforesaid inventions and improvements.

Eighth. And your orator further shows unto your Honors that it is informed and believes and therefore avers, that the defendants herein, well knowing the premises and the rights and privileges secured to your orator as aforesaid, by contriving to injure your orator and deprive it of the benefits and advantages which would otherwise accrue to it from the inventions and improvements of said Letters Patent No. 664,383, and after your orator, The Commercial Acetylene Company, became the owner thereof as aforesaid, and after the exclusive license granted to your orator The Prest-O-Lite Company aforesaid, and prior to the commencement of this suit at the City of St. Louis and State of Missouri and Eastern Division of the Eastern District of Missouri and elsewhere within the United States, without license and allowance, and against the will of your orators, and in infringement of said letters patent as aforesaid, have made or caused to be made, used, or caused to be used, sold or caused to be sold, apparatus made according to and embodying the inventions and improvements described in the said letters patent No. 664,383 for use on automobiles, carriages and other movable vehicles; and they intend and threaten to continue to make, use and sell more of said apparatus; all in defiance of the rights required by and secured to your orator as aforesaid, and in infringement of said letters patent aforesaid, and each of them, and by which your orators have and will sustain great and irreparable loss and injury, and by which your orators have been and are still being deprived of great gains and profits, which they might and otherwise would have obtained, but which have been received and enjoyed by the defendants by and through their unlawful acts and doings.

Ninth. And your orators further show unto your Honors that they are informed and believe, and therefore aver, that the defendants have made and realized large gains and profits and advantages from the manufacture, use and sale of the inventions and improvements described and claimed in said Letters Patent aforesaid, and each of them, and of apparatus embodying said inventions and improvements and each of them, but to what extent, and how much your orator does not know and prays discovery thereof.

Tenth. And your orators further show unto your Honors that

the manufacture, use and sale by said defendants of the aforesaid inventions and improvements and of apparatus embodying the same, and their unlawful acts and doings have had, and will have, the effect to encourage and induce others to venture to infringe said Letters Patent and each of them in disregard of your orator's rights.

Eleventh. And forasmuch as your orator can have no adequate relief, except in this Court, and in that such proceedings are contrary to equity, to the end therefore that the defendant may, if it can, show why your orator should not have the relief hereby prayed and may without oath (answer under oath being hereby expressly waived), according to the best and utmost of their knowledge, remembrance, information and belief, full, true, direct and perfect answer make to all and singular the premises and the matters and the things hereinbefore stated and charged as fully and particularly as if severally and separately interrogated as to each and every of said matters and as if the same were hereinafter repeated, and that said defendants may be decreed to account for and pay over to your orator the gains and profits realized by the said defendants by their unlawful acts, and in addition the damages sustained by your orator, and that the actual damages so assessed may be increased to a sum equal to three times the amount of said assessment under the circumstances of the unlawful and unjust infringement your orator prays; that the said defendants, their associates, attorneys, solicitors, clerks, servants, agents and workmen and each and every of them may be perpetually enjoined and restrained by a decree of this court from directly or indirectly making, using, selling or otherwise disposing of, and from offering to make, use or sell, or otherwise dispose of in any manner, any apparatus made according to or containing the inventions described and claimed in said Letters Patent No. 664,383 aforesaid, and from in any way or manner,
7 directly or indirectly, infringing upon or violating said Letters Patent, and that the defendants may be decreed to pay the costs, charges and disbursements of this suit, and that your orators may have such other relief as the equity of the case may require, and as to your Honors may seem meet.

Twelfth. And your orators further pray that a preliminary or provisional injunction may be issued out and under the seal of this Honorable Court, enjoining and restraining said defendants, their associates, attorneys, solicitors, clerks, servants, agents, and workmen and each and every of them from further infringement of said letters Patent or either of them during the pendency of this suit.

Thirteenth. And may — please your Honors to grant unto your orators not only a writ of injunction conformable to the prayer of this bill, but also a writ of subpœna ad respondendum issued out of and under the seal of this Honorable Court directed to the said Defendants, The Fire Ball Gas Tank and Illuminating Company and David L. Soloman, commanding them at a certain time and under a certain penalty therein to be named, to be and appear before this honorable Court, then and there to answer unto this bill of complaint and perform and abide by such order or decree in the prem-

ises as to this Honorable Court shall seem meet and may be required by the principles of equity and good conscience.

And your orators will ever pray, etc.

[SEAL.] COMMERCIAL ACETYLENE CO.
PREST-O-LITE CO.,
By EDWARD BEERS,
Sec'y of The Commercial Acetylene Co.

Attest:
EDWARD BEERS, *Sec'y,* [SEAL.]
By WM. P. BARTLETT,
WINTER & WINTER,
Of Counsel for Complainants.
FORDYCE, HOLLIDAY & WHITE,
Solicitors for Complainants.

STATE OF NEW YORK,
City and County of New York, ss:

Edward Beers, being first duly sworn, deposes and says; That he is the Secretary and an officer of the Commercial Acetylene Company, one of the complainants in the foregoing bill of complaint; that he has read the same and knows the contents thereof, that the same is true of his own knowledge, except as to the matters
8 therein stated to be alleged on information and belief, and as to those matters he believes it to be true.

EDWARD BEERS.

Sworn to before me this 28th day of July, 1911.
[SEAL.] GEORGE LINK, JR.

Filed Aug. 17, 1911. James R. Gray, Clerk, Commissioner of Deeds, New York City.

And afterwards, to-wit: On the 21st day of August 1911 there were filed in said cause the separate answers of the said defendants Fireball Gas Tank and Illuminating Company and David L. Solomon, which said separate answers are respectively set forth on page 243 et seq. and page 253 et seq. of this Transcript.

(*Replication to Answer of Defendant Fireball Gas Tank and Illuminating Company, Filed in the Circuit Court on Oct.* 16, 1911.)

These repliants, The Commercial Acetylene Company and The Prest-O-Lite Company, saving and reserving to themselves all and all manner of advantage of exception, which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the said defendant Fireball Gas Tank & Illuminating Company for replication thereunto, saith, that they do and will aver, maintain and prove their said bill to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer

of the said defendant is very uncertain, evasive, and insufficient in law, to be replied unto by these repliants; without that, that any other matter or thing in the said answer contained, material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied is true; all which matters and things these repliants are ready to aver, maintain and prove as this Honorable Court shall direct, and humbly pray as in and by their said bill they have already prayed.

FORDYCE, HOLLIDAY & WHITE,
Solicitors for Plaintiffs.

JNO. P. BARTLETT,
WINTER & WINTER,
Of Counsel.

(*Replication to Answer of Defendant David L. Solomon, Filed in the Circuit Court on Oct.* 16, 1911.)

9 These repliants, the Commercial Acetylene Company and The Prest-O-Lite Company, saving and reserving to themselves all and all manner of advantage of exception, which may be had and taken to the manifold errors, uncertainties and insufficiencies of the answer of the said defendant David L. Solomon for replication thereunto, saith, that they do and will aver, maintain and prove their said bill to be true, certain and sufficient in the law to be answered unto by the said defendant, and that the answer of the said defendant is very uncertain, evasive, and insufficient in law, to be replied unto by these repliants; without that, that any other matter or thing in the said answer contained, material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed or avoided, traversed or denied, is true; all which matters and things these repliants are ready to aver, maintain and prove as this Honorable Court shall direct, and humbly pray as in and by their said bill they have already prayed.

FORDYCE, HOLLIDAY & WHITE,
Solicitors for Plaintiffs.

JNO. P. BARTLETT,
WINTER & WINTER,
Of Counsel.

Order to Show Cause.

The Court having seen and heard the bill of complaint heretofore filed herein, it is Ordered that said defendants and each of them be and appear in this Court, on Friday, October 27th, 1911, at ten (10) o'clock A. M. or as soon thereafter as counsel can be heard, and then and there show cause, if any they have, why the preliminary injunction should not issue pursuant to the prayer of the bill of complaint herein.

It is further Ordered that said defendants, be granted to and including October 23rd, 1911, in which to file their affidavits in opposition to the application for preliminary injunction; thereupon said defendants by their solicitor, in open Court waives the issuance of the order to show cause, and accepts service of same.

October 16th, 1911.

(Signed) DAVID P. DYER, *Judge.*

(*Affidavits for Complainants.*)

And afterwards, to-wit: On the 17th day of October A. D. 1911, there were filed in said cause on behalf of the said complainants the affidavits of Theodore du Moulin, Theodore W. Smith and Oramel H. Skinner, which said affidavits are respectively in words and figures, as follows, to-wit:

10 (*Affidavit of Theodore du Moulin.*)

STATE OF ILLINOIS,
County of Cook, City of Chicago, ss:

Theodore du Moulin being duly sworn deposed and says: On the third day of June, 1911, between the hours of eleven A. M. and twelve M. I called at the place of business of the Fireball Gas Tank & Illuminating Company at 5010 Delmar Avenue in the City of St. Louis, State of Missouri, and on payment of the sum of thirty dollars and the delivery of three empty Prest-O-Lite tanks B style numbered respectively 516,057, 59,384 and 145,883, received from the Fireball Gas Tank & Illuminating Co. three of its tanks numbered respectively 968, 977 and 979, annexed hereto marked respectively A and B and made a part of this affidavit are receipted bill received by me from the Fireball Gas Tank & Illuminating Company upon delivery to them of three Prest-O-Lite tanks above referred to and the payment of the aforesaid sum of thirty dollars, and a copy of an agreement dated at St. Louis, Missouri, on June 3, 1911, signed by me, the original of which agreement was retained by the Fireball Gas Tank & Illuminating Company.

I placed the three Fireball tanks in an automobile which was waiting in front of the office of the Fireball Company and rode directly to the residence of Dr. Frederick Russe 3846 Lindell Avenue, St. Louis, Missouri, and on the same day June 3, 1911, at about 12:30 P. M. I personally delivered to and left with Dr. Russe personally Fireball tank 968 with instructions to cause to be made a chemical analysis of the contents thereof. I caused to be placed upon the said tank the initials "T. M. 6/3/11."

On the said 3d day of June, 1911, I placed the following upon Fireball tank No. 977: "TDM 6/3/11.", placed wrapping paper around the valve through which the gas comes when in use, tied cord around the wrapping paper and thereupon sealed the knot. I also placed the said matter, to-wit, "TDM, 6/3/11" upon the wrapping paper over the valve on said tank. Thereupon, and on the same day, I delivered the said tank to the Adams Express Company

for transmission to Oramel H. Skinner, care of Prest-O-Lite Company, 227 E. South Street, Indianapolis, Indiana. Annexed hereto marked C and hereby made a part of this affidavit is the receipt of the Adams Express Company for said tank.

On the said 3d day of June, 1911, I placed upon Fireball tank 979 the following "TDM, 6/3/11," placed wrapping paper around the valve through which the gas comes when in use, tied cord 11 around the wrapping paper and thereupon sealed the knot.

I also placed the said matter, to-wit: "TDM, 6/3/11," upon the wrapping paper over the valve on said tank, [—] to the American Express Company for transmission to Arthur D. Little, State Street, Boston, Mass. Annexed hereto marked D and hereby made a part of this affidavit is the receipt of the American Express Company for said tank.

At no time from the receipt by me of the said tanks to the disposition of same by me as aforesaid, were the tanks or any of them out of my sight or possession, nor did any one whomsoever tamper in any manner with the tanks or their contents.

This affidavit is made by me for the purpose of being used in an action about to be filed in the United States Circuit Court for the Eastern District of Missouri, between the Commercial Acetylene Company as complainants, and the Fireball Gas Tank Illuminating Company, and others, as defendants.

THEODORE DU MOULIN.

Subscribed and sworn to before me this 13th day of June, A. D. 1911.

[SEAL.] PERCY M. KNIGHT,
Notary Public, Cook County, Ill.

My Commission expires May 13, 1914.

Filed Oct. 17, 1911. James R. Gray, Clerk.

"A."

Fireball Gas Tank & Illuminating Co.,
St. Louis Branch, 5010 Delmar Blvd.

Sold to T. Du Moulin, Jefferson Hotel, City.

Order No. 999.
No. Orig. F. B. T. 977-963-979.
No. MT. F. B. T. Rec'd for re-fill —
No. F. B. T. del'd in exch. —
Terms: —.
Salesman: J. S.

3 Fire Ball complete	90.00
With exchange	60.00
	30.00

FIRE-BALL GAS TANK & ILL. CO.,
Per S. O. B.

Paid June 3, 1911.

13 & 14 The Company's charge is based upon the value of the property, which must be declared by the shipper.

31 B "C." ADAMS EXPRESS COMPANY. (Not Negotiable.)

Received from Theo. Du Moulin the following Articles, subject to the Contract printed below:

Date.	No.	Article.	Value.	C. O. D.	Consignee.	Destination.	Charges.	Received for the C.
190 6 3	1	Cyl.	40 00		Oramel H. Skinner c/o	Prest-O-Lite Co., Indianapolis, Ind.	Adams	Ex. Co. (1) Byrd.

1. In consideration of the rate charged for carrying said property, which is regulated by the value thereof and is based upon a valuation of not exceeding fifty dollars unless a greater value is declared, the shipper agrees that the value of said property is not more than fifty dollars, unless a greater value is stated herein, and that the company shall not be liable in any event for more than the value so stated, nor for more than fifty dollars if no value is stated herein.

2. If the express company has not an agency at the point of destination, it shall carry the property to its agency nearest or most convenient thereto, and there notify the consignee, or deliver the property to some other carrier to continue the transportation. The Adams Express Company shall not be liable for loss or damage occurring after such delivery, nor for detention after having tendered the property to a connecting carrier.

3. The Express Company shall not be required to make free delivery at points where it maintains no free delivery service, nor at any point beyond its established delivery limits.

4. The Express Company, unless negligent, shall not be liable for loss, damage or detention of said property caused by civil or military authority, piracy, insurrection, strikes or riot, or by the act of any person acting as an officer of the Law, whether with or without lawful process, warrant or authority, or by the dangers of railroad transportation the perils of navigation, changes of temperature, heat, cold, wet or decay, nor for the death, injury or escape of live freight, the Company not being a carrier thereof except at owner's risk.

5. Said property is accepted as merchandise, only, and the Express Company shall.....liable in any event for the loss of money, specie, bonds, coupons, or other negotiable.....which the Company does not receive or carry except through its money department pr.....for that purpose.

6. The Express Company shall not be liable for loss, damage or detention of said p.....unless a claim therefor shall be presented to it in writing at this office within ninety days.....this date with this contractor a copy thereof annexed; nor shall the company be liable.....suit to recover for the loss, damage or detention of said property unless the same shall be.....menced within one year after such loss, damage or detention shall have occurred, an.....afterwards.

7. Articles of Glass, articles contained in glass and fragile articles are accept..... owner's risk.

8. If any C. O. D. is not paid within thirty days, the shipper agrees that the Express Co. may return the property, and that he will pay the charges for transportation both ways.

9. The terms and conditions of this contract shall apply to any forwarding or return property, and shall inure to the benefit of every carrier to whom the same may be entru.....complete the transportation.

12 ST. LOUIS, MISSOURI, 6/3/1911.

Received Fireball Gas Tank No. 977-963 from Fireball Gas Tank & Illuminating Company for the personal use of T. Du Moulin subject to the following terms, conditions, restrictions, and reservations of title (To all of which said user hereby assents), namely:

Fireball Gas Tank & Illuminating Company hereby gives notice that this tank has not been sold by it outright, but subject to the following conditions, and that it has reserved to itself, and hereby reserves, such title thereto that it retains the right to prescribe the retail price at which same shall be sold and the exclusive right to refill same with gas and to declare sale thereof at any other price or sale or use if refilled by any other person an unauthorized use of devices protected or about to be protected by patents issued to it and unauthorized use of the trademark "Fireball" and [*cilation*] of property rights in said tank under said reservation of title therein, and to declare sale or use of said tank to which a plate bearing this notice is attached at the time issued by it after removal or defacement or covering over of said plate a violation of its said patent, trade-mark, and property rights, and acceptance of this tank bearing this notice constitutes a contract by dealers that same shall be sold at retail only at the price of thirty dollars and by users that same will not be used if refilled by any one other than said Company, and retail sale at any other price will violate said contract and, also, constitute infringement of its said letters-patent and of the trade-mark "Fireball", and the use thereof when filled with gas by any one other than said Company will violate said contract and also constitute infringement of its said letters-patent and of its trade-mark "Fireball" and a trespass on its property rights under said reservation of title. Violation by either dealers or users of the rights of said Company under its said contract, reservation of title, trade-mark, or letters-patent will result in legal proceedings.

In consideration of the convenience that will be afforded said user by said Fireball Gas Tank and Illuminating Company in the exchange of empty "Fireball" gas tanks for charged "Fireball" gas tanks for the usual recharging price, said user hereby agrees that the foregoing notice, conditions, restrictions, and reservation of title shall apply to all other "Fireball" gas tanks that said user may at any time receive as charged exchanges for said user's empty "Fireball" gas tanks.

[SEAL.] THEODORE DU MOULIN,

By ——— ———.

(Here follows paster marked pages 13 and 14.)

15 American Express Company at St. Louis, Received of Theo. Du Moulin.

The property hereinafter described, which the Express Company undertakes to forward to the nearest point to destination reached by it, subject to the terms and conditions of the Company's regular form printed on inside front cover of this book and which terms and conditions are agreed — by the shipper or owner in accepting this receipt.

(6049 & 6051) (Not Negotia-

Date.	Description and contents.	Value asked and given as	Addressed to	Destination.	Receipted by
6 3	1 Cyl.	$40 00	Arthur D. Little, State St.	Boston, Mass.	

AMERICAN EXPRESS CO.,
By G. OTTO.

(Affidavit of Theodore W. Smith for Complainants.)

STATE OF INDIANA,
County of Marion, ss:

Theodore W. Smith, being duly sworn, according to law, deposes and says as follows:

My name is Theodore W. Smith. I am of mature age, and reside in the City of Indianapolis, State of Indiana. I am a practicing chemist of that city, and have been so for about twenty years. I graduated at Wabash College at Crawfordsville, Indiana, in the Class of '86, with a degree of A. B.; spent the following years as assistant having charge of analytical work in a chemical laboratory, and the following year I spent in Gottingen, Germany, pursuing my study of chemistry and physics under Victor von Meyer. I returned to Indianapolis in 1889, and there took charge of a course in chemistry and physics in the High School of that city for four or five years, after which I established a laboratory, in which I have since practiced my profession as a chemist. I have been chemist to the State Geologist for a number of years, and have also been employed by the State Board of Health in the analysis of food stuffs, and have been employed by the Indiana Millers' Association. I have also been employed for several years by a large creosoting plant, besides a general clientele among glass companies, etc.

I have appeared several times before the Patent Commissioners as an expert witness on construction of letters patent and interpretation thereof, and have examined over two thousand patents.

16 During these many years in my profession as a chemist, I have been accustomed to and have made it my special work to carefully and accurately analyze and determine the chemical and general components of compounds and substances, and have become and am an expert in that line and continually employed thereon.

I have read and am acquainted with United States Letters Patent to Claude and Hess No. 664,383, dated December 25, 1900, and the improvements therein shown and described, and specifically referred to in claims 1, 2 and 5 thereof.

The device disclosed in the said letters patent is an apparatus adapted to serve as a gas package, and consists essentially of a closed receptacle or tank containing acetylene in solution and the essential adjuncts of this tank are an outlet for the acetylene gas, which escapes through the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape there through at substantially uniform pressure. This control of the pressure being necessary for and maintained for the purpose of delivering the gas at the burner tips at a diminished pressure, so regulated and sustained that the burner flame shall be steady and regular during the period for which it is desired and intended to be used as an illuminant.

This gas package is a unit in itself and a complete illuminating apparatus, and contains in itself with the addition of suitable burners the entire means of producing a brilliant, continuous illumination for a number of hours, relatively enormous when compared with the bulk of the package. Thus the gas package manufactured under these letters patent by The Prest-O-Lite Company and known as the Prest-O-Lite Gas Tank, will produce continuous illumination for forty hours. This invention of Claude and Hess is covered by these letters patent and consists of the application of their discovery of dissolved acetylene to the gas package described in the letters patent. Has been one of great utility and has permitted the application of acetylene lighting to moveable vehicles without the inconvenience, annoyance, dirt and dissatisfaction of the self-generating apparatuses formerly used for this purpose. This remarkable utility is attested by the enormous sales of complainant's gas package, the Prest-O-Lite gas tank, of which there are over 400,000 in constant use.

The preferred solvent used in connection with and as one of the elements of this gas package, and, as Claude and Hess discovered, the preeminently useful one, is acetone, which at the moderate pressure of 12 atmospheres dissolves 300 times its own volume of acetylene, as Claude and Hess first showed.

17 On the 5th day of June, 1911, Oramel H. Skinner, general superintendent of The Prest-O-Lite Company, personally delivered to me a crated gas tank and instructed me to examine this said tank contained in the crate and analyze the contents thereof. This crate had been shipped by the Adams Express Co. of St. Louis, and bore upon it a shipping tag reading as follows: "Ormal H. Skinner per Prest-O-Lite Co., 227 E. South Street, Indianapolis, Indiana," "From Prest-O-Lite Co., St. Louis, Mo., Theodore du Moulin."

The valve of the said tank contained in the crate was wrapped with thick brown paper, tied with a string, the knot of which was sealed with sealing wax. On this paper was written "T d M 6/3/11". The seal upon this valve at this time was intact. This said tank

was bronze colored and had soldered upon its side a name plate with the following inscription:

"Fireball Gas Tank No. 977. Pat'd March 14, 1911.

"Reservation of Title. Notice of Conditional Sale.

Warning against Infringement.

Fire Ball Gas Tank and Illuminating Company hereby gives notice that this tank has not been sold by it outright, but subject to the following conditions, and that it has reserved to itself, and hereby reserves, such title thereto that it retains the right to prescribe the retail price at which same shall be sold and the exclusive right to refill same with gas and to declare sale thereof at any other price or sale or use if refilled by any other person an unauthorized use of devices protected or about to be protected by patents issued to it and unauthorized use of the trade mark "Fire Ball" and violation of property rights in said tank under said reservation of title therein, and to declare sale or use of the tank to which the plate is attached at the time issued by it bearing this plate. After removal of said plate violation of its said patent, Trade-mark, and property rights and acceptance of this tank bearing this notice constitutes a contract by dealers that the same shall be sold at retail only at the price of $30, and by users that same will not be used if refilled by any one other than said company, and retail sale at any other price will violate said contract, and also constitutes infringement of its said letters patent and of the Trade-mark "Fire ball" and the use thereof when filled with gas by any one other than said company will violate said contract and also constitute infringement of its said Letters Patent and of its Trade-mark "Fire ball" and a trespass on its property rights under said reservation of title. Violation by either dealers or users of the rights of said company under its said contract, reservation of title, trade-mark, or Letters Patent will result in legal proceedings.

18 FIRE BALL GAS TANK AND ILLUMINATING CO.,
St. Louis, U. S. A."

This tank I am informed and believe was manufactured by the Fire Ball Gas Tank Illuminating Company, St. Louis, Missouri. A careful examination of this said Fire Ball Tank No. 977, and a comparison of it with Claims 1, 2 and 5 of the Claude and Hess patent of the United States Letters Patent No. 664383 and the specifications thereof, disclosed that the said Fire Ball Tank No. 977 was the same in all essential particulars as the apparatus or device or gas package described in the Claims 1, 2 and 5 of the said Claude and Hess Letters Patent of the United States No. 664383. This Fire Ball Gas Tank No. 977 at that time consisted of a closed

vessel containing in use a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure.

The vessel or bronze cylinder was provided with an outlet for acetylene gas escaping from the solvent when the pressure is reduced or released, and is further provided with a means for controlling this outlet in such a way that the gas escapes there through at substantially uniform pressure for the time and purpose of the intended use, as I have proved by experiment. The tabulated results of my examination and test made on the said Fire Ball Gas Tank No. 977 at this time was as follows:

Gas pressure in tank by tank gauge	260 lbs.
Size of tank, external, cylindrical	6 x 22 inches.
Weight of tank and contents	24 lbs. 12½ oz
Weight of tank less gas	22 lbs. 11 oz.
Weight of tank less gas & Liquid, solvent	18 lbs. 15 oz.
Weight of gaseous contents of tank	2 lbs. 1½ oz.
Weight of liquid contents of tank	3 lbs. 12 oz.
Gas, cubic feet by calculation	30.4
Gas, cubic feet by meter	32
Liquid by weight	60.0 oz.
Liquid by measure	74.0 oz.

Composition of the gas:

Acetylene	98%
Air, oxygen & Nitrogen	2%

Composition of the liquid:

Acetone	98½%
Turpentine, light, spirits	1½%
Gravity of liquid	0.796
Boiling point	58° to 59° C.

19 An analysis made of the gas drawn from the cylinder of this said tank indicated that it consisted of about 98% of acetylene and 2% of air, oxygen and nitrogen.

The analysis of the solvent distilled from the said tank disclosed that it contained 98½% of acetone and 1½% of turpentine. This turpentine has a very small property as a solvent of acetone, and in my opinion was used simply to disguise the odor of the acetone, so that it could not be readily distinguished as such.

In my opinion, therefore, the said Fire Ball Gas Tank No. 977 constituted as an apparatus, a gas package:

The combination of a closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the escape of the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and a means for controlling said outlet whereby the gas may escape there through at a substantially uniform pressure. All substantially as described in said Claude and Hess patent, and specifically referred to in Claim 1 thereof;

Also a prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel, and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent as the package is arranged and positioned for use, with a reducing valve, as specifically referred to in claim 2 of said Claude and Hess patent.

Also a gas package comprision a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent, and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, as specifically referred to in Claim 5 of said Claude and Hess patent.

I will not attempt to detail the great improvement in the chemical art of the discovery of Claude and Hess dissolved acetylene. This is a matter of common knowledge now and is commented on by such authorities on acetylene as Lewes and Leeds & Butterfield. This discovery of Claude and Hess of the affinity of acetylene and acetone resulted in their further invention of the gas package described in the letters patent in suit; i. e., the discovery of dissolved acetylene enabled Messrs. Claude and Hess to invent the wonderful apparatus which is now in use in automobiles and known as an acetylene gas tank. The utility of this invention can be summarized by the statement that it has rendered night riding in automobiles practicable.

This affidavit is made by me as I am informed and believe for the purpose of being used in an action about to be filed in the United States Circuit Court for the Eastern District of Missouri by the Commercial Acetylene Co., and the Prest-O-Lite Company v. Fire Ball Gas Tank and Illuminating Co., and David L. Solamon.

THEODORE W. SMITH.

Sworn to before me this 19th day of August, 1911.

[SEAL.] MARGARET WELLS,
Notary Public.

My com. expires Nov. 4, 1912.

Filed Oct. 17, 1911, James R. Gray, Clerk.

(*Affidavit of Oramel H. Skinner for Complainants.*)

STATE OF INDIANA,
County of Marion, ss:

Oramel H. Skinner, being first duly sworn, deposes and says: I am the Oramel H. Skinner described in the affidavit of Theodore W. Smith, made in this case.

I am the superintendent and chemist of the Prest-O-Lite Company, one of the complainants herein, and have been such since June 1907. In the course of my employment I have been actually engaged in the preparation and manufacture of the product of The

Prest-O-Lite Company—the Prest-O-Lite Gas Tank—. I am familiar with the manufacture of these gas tanks, their preparation, and the manner in which the Prest-O-Lite Company sells and prepares them for sale.

I have read the affidavit of Theodore W. Smith, and am familiar with the same, and as to all those matters relating to the gas package described in the United States Letters Patent No. 664383, and the utility of the invention described therein, I swear to be true of my own knowledge.

The Prest-O-Lite Gas Tank which is manufactured under these letters patent has been in constant use since 1904, and in
21 that time over 400,000 of these devices or gas packages have been sold and are being constantly used under the system established by The Prest-O-Lite Company of exchanging empty Prest-O-Lite cylinders for the full cylinders. This apparatus, together with the system of exchanging cylinders, has completely revolutionized the art of supplying light to automobiles at night, and has also gone into extensive use in lighting buoys and railway cars and yachts. Almost every manufacturer of automobiles in the United States uses the Prest-O-Lite gas tank, and its attendant system, as a part of the standard equipment of its car, and advertises it as such. The Prest-O-Lite Gas Tank is the best known automobile accessory now in use.

On the 5th day of June, 1911, I received from the Adams Express Company from St. Louis the tank described in the affidavit of T. W. Smith. This said tank was in the same condition when I delivered it to said T. W. Smith as it was when I received it from the employe of the Adams Express Company, all as described in the said affidavit of T. W. Smith. I examined the said tank and have examined other of said tanks manufactured by the Fire Ball Gas Tank and Illuminating Company of St. Louis, and am thoroughly familiar with that tank. This said tank consists of a bronze container equipped with a valve at the outlet of the container, which valve consists of a means for reducing the pressure of the gas from a high pressure within the container to a relatively small pressure on the outside of the container and controls the escape of the acetylene so that it is delivered at a substantially uniform pressure. This valve is a reducing valve and is the same valve as that attached to the Prest-O-Lite Gas Tank and the Autogas Tank, which was manufactured by the Avery Portable Lighting Company of Milwaukee. This Fire Ball Gas Tank contains acetylene dissolved under pressure in a solvent, as I have discovered by my examination of same. The Fire Ball Tank in my opinion is the same device essentially as The Prest-O-Lite Gas Tank, and as the gas tank described in the claims, 1, 2 and 5 of the United States Letters Patent No. 664383, with which I am thoroughly familiar.

This affidavit is made by me for the purpose of being used in an action to be filed by The Commercial Acetylene Company and The Prest-O-Lite Company in the United States Circuit Court for the Eastern District of Missouri against the Fire Ball Gas Tank and Illuminating Company and David L. Solamon.

ORAMEL H. SKINNER.

22 Sworn to before me this 7th day of August, 1911.

[SEAL.] MARGARET WELLS,
Notary Public.

My Com. expires Nov. 4/12.

Filed Oct. 17, 1911. James R. Gray, Clerk.

And thereafter, to-wit: on the 23rd day of October 1911 there were filed in said cause the return of the said defendants to the aforesaid order to show cause, together with twenty-three affidavits in support of the said return, which said return is set forth upon page 263, et seq. of this transcript, and which said twenty-three affidavits are set forth on page 34, et seq. and on page 281, et seq. of this transcript.

23 In the United States Circuit Court in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK AND ILLUMINATING COMPANY et al., Defendants.

Defendants' Record on Motion for Preliminary Injunction.

24 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

vs.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
District of Columbia, City of Washington, ss:

Percy B. Hills, being duly sworn, on his oath deposes and says, as follows:

I am forty-three years of age, and a resident of Washington, D. C., and there practice as an attorney and counselor at law and as a solicitor of patents and as an expert in patent causes. I finished my scholastic education at the Columbian University, Washington, D. C., and thereafter was employed in the office of a well-known patent practitioner in Washington, D. C., entering his office in 1885. Beginning in 1885 and continuously ever since I have been en-

gaged in the study of applications for patents and of patents for inventions, and during this time I have had occasion to study, prepare for filing, and prosecute before the Patent Office very many applications for patents relating to diverse subjects-matter, in number running into the hundreds, said subjects-matter being classifiable in substantially all of the classes into which the arts are divided according to the Patent Office classification. During the same period of time I have performed and conducted hundreds of investigations as to the scope, validity, and infringement of various patents for inventions relating to substantially all the arts into which inventions are classified by the Patent Office. I have, also, participated either as counsel or expert in many suits involving United States letters-patent.

25 I have carefully read the Claude & Hess United States patent No. 664,383, dated December 25, 1900, and thoroughly understand the same, and I have read and studied the files of the Patent Office showing the proceedings in the Patent Office connected with the application therefor, including the appeals to the Board of Examiners-in-Chief and to the Commissioner of Patents in Person, and thoroughly understand same. I have, furthermore, read and studied and thoroughly understand the patents and publications cited by the Patent Office against said application for said Claude & Hess patent No. 664,383 and various other prior patents and publications relevant thereto.

I have, also, read and studied and thoroughly understand the proceedings in the Patent Office, including the appeals to the Board of Examiners-in-Chief and Commissioner of Patents in Person, relative to the application of Claude & Hess for patent for Method of Storing Acetylene Gas for Distribution, serial No. 625,581, and the various patents and publications cited by the Patent Office against said application. The distinction between said application and that for the patent in suit is that the one numbered 625,581 is entitled as for "Method of Storing Acetylene Gas for Distribution," while the patent in suit, No. 664,383, is entitled "Apparatus for Storing and Distributing Acetylene Gas." Said method application was rejected by all the tribunals of the Patent Office—i. e., by the Principal Examiner, then by the Board of Examiners-in-Chief on appeal, and then, on further appeal, by the Commissioner of Patents in Person. Said method application was then abandoned by the applicants by their failure to appeal from the Commissioner of Patents in Person to the Court of Appeals of the District of Columbia, and will, therefore, hereinafter be referred to as the abandoned method application of Claude & Hess.

The Claude & Hess Patent in Suit, No. 664,383.

The specification of the patent in suit describes an apparatus for the storage and distribution of acetylene gas comprising a tank divided into two compartments by a partition or diaphragm d^3, the outlet from the lower of said compartments being governed by "a reducing-valve d" and the exit from the upper of said compartments

of said tank being controlled by a valve c^3. The specification says that tanks such as just described are "to be charged or prepared at a central station or distributing point and shipped or transported to the intended place of use as a complete article or 'package' adapted to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated" (lines 19-25, page 1, of the patent). From this it is evident that the specification of the patent does not suggest the use of this apparatus as a gas tank for automobiles, carriages, or the like. The specification, furthermore, distinguishes between the use of the apparatus shown in Figure 1 of the patent in suit and that illustrated in Figure 2 of the patent in suit by indicating the use of the former for lighting one room and the use of the apparatus disclosed in Figure 2 for lighting a building, saying (lines 21-24, page 2 of the patent): "When the gas-storing apparatus is to be connected with supply-pipes for distribution throughout a building, it is desirable to duplicate the apparatus, as shown in Figure 2."

The specification describes the function of the two compartments in the tank *a* as being that the lower "shall contain a fluid *b*, such as alcohol or acetone, capable of dissolving acetylene gas." The upper chamber is intended to contain acetylene gas that has escaped out of the fluid *b* contained in the lower chamber, said escape being controlled by the reducing-valve *d*.

The specification of the Claude & Hess patent explicitly states (line 27, page 1) that it is one of the essentials of the invention of that patent that the outlet for the gas held in solution in the solvent *b* shall be "so positioned as to be normally above the level of said solution." The reason why the patentees regarded the location of the outlet for the gas "at a point above the solvent" as one of the essentials of the invention is because the specific gravity and physical characteristics of acetone and alcohol are such that these liquids naturally sink to the bottom of the vessel containing the "supersaturated solution," thus freeing a certain amount of acetylene gas, which, being lighter than the liquid solvent *b*, rises to the upper part of the chamber or vessel containing said "supersaturated solution"; and, if said outlet for the gas is located lower than the level of the liquid solution, the gas when emitted will carry the liquid with it, this operation being termed "blowing" of the solvent. "Blowing" of the solvent is objectionable for various reasons, among which may be mentioned the waste of it and, also, the untimely loss of the wasted solvent. The means for introducing acetylene gas under pressure into the solvent *b* in tank *a* is arranged in a manner consistent with the above-mentioned statement of the specification that it is one of the essentials of this apparatus that the outlet for the gas shall be "so positioned as to be normally above the level of said solution," i. e., the specification (lines 35 et seq., page 1) saying: "It is desirable, moreover, that the receptacle which contains the liquid solvent should be conveniently arranged for the charging process as well as for the discharging process, and to that end the said receptacle is shown as consisting of a fluid-tight vessel having an inlet as well as the outlet; the mouth of said inlet

being extended below the surface of the solvent liquid, so that gas introduced through the same will pass through the liquid to aid in the solution of said gas."

Seventeen times, at least, in the specification and claims of this Claude & Hess patent is found the term "reducing-valve" and three or more times besides is a reducing-valve explicitly referred to by such definite references as, for instance, the expression in line 13 of page 2 of said patent, which mentions the "adjusting-stem d^8 of said valve." This element of the Claude & Hess apparatus controls the "outlet" above mentioned, which the Claude & Hess specification says must, as one of the essentials of their invention, be "so positioned as to be normally above the level of said solution," said specification, furthermore, saying (line 50 et seq., page 1 of the patent, *italics mine*): "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, *and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve* being herein shown as interposed between the interior of the receptable which contains the dissolved gas and the outlet from which said gas is allowed to escape for use."

The dominant idea of the Claude & Hess patent is evidenced by the language just quoted and by the numerous direct and additional indirect references to a reducing-valve as means for controlling the outlet of the gas from the chamber containing the solvent *b*, whereby the gas may escape therethrough at substantially uniform pressure, and that dominant idea is that it is an advantage "for the proper operation of the burners" that the gas shall be delivered thereto under substantially uniform pressure only slightly above the atmospheric pressure, "and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve" *d* being shown and described in the Claude & Hess patent in suit as "interposed between the interior of the receptacle which contains the dis-
28 solved gas and the outlet from which said gas is allowed to escape for use." This phraseology of the specification makes it clear that the patentees regarded as highly important the provision of some automatic means for controlling the exit of the gas, so as to secure substantially uniform pressure at the burners; and as any means that would effectuate that purpose of the patentees would be properly denominated a reducing-valve, and as the type of device called a reducing-valve is and for many years has been extremely well known and widely used in many arts, the patentees in their specification naturally described and embodied a reducing-valve of ordinary construction as suitable means for controlling the outlet whereby the gas would be allowed to escape through the burners at substantially uniform pressure.

The Century dictionary defines a reducing-valve as "a peculiar valve controlled by forces acting in opposite directions." The Century dictionary further describes a reducing-valve as follows: "The

parts are so arranged that the valve opens to its extreme limit only when the pressure on the delivery side is at a prescribed minimum, closing the part in the valve-seat more or less when this minimum is exceeded. The pressure on the delivery side of the valve is thus kept from varying (except between very narrow limits) from its predetermined pressure, although the pressure on the opposite side may be variable, and always higher than on the delivery side. Such valves are much used for maintaining lower pressures in steam-heating and-drying apparatus than is carried in the boiler. They are also used in automatic air-brakes for railways and in other pneumatic machines, and, in some forms, as gas-regulators for equalizing the pressure of gas delivered to gas-burners, etc. Also called pressure-reducing valve."

Summary.

Everything in the specification and drawings (with nothing therein to the contrary) shows that the following is a correct summary of the alleged invention of the Claude & Hess patent No. 664,383:

The specification contemplates a vertically-arranged tank having two compartments therein separated by a partition d^3. The lower of said compartments is to contain a liquid b "such as alcohol or acetone" capable of acting as a solvent for acetylene gas and holding same in solution. The upper chamber is intended to hold a relatively small supply of acetylene gas evolved from the solvent b and stored in said upper chamber of said receptacle or tank
29 a at reduced pressure. The acetylene gas is introduced into the solvent b by means of pipe a^2, which conducts it to the bottom of the compartment holding the solvent b, and said gas is thus introduced under pressure. The specification of this patent describes the emission of the gas to and through the burners in the following language (beginning at line 92, page 1):

"In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure (the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom), a reducing-valve d of any suitable or usual construction is interposed between the interior of the receptacle and the outlet c therefrom. As herein shown, the said reducing-valve is in a passage d^2, connecting the spaces below and above a wall or partition d^3 near the upper portion of the receptacle a, the dissolved acetylene being contained in that portion of the receptacle which is below the said partition, the portion above being normally empty and forming a reservoir for the gas at low pressure which has passed into said reservoir through the said reducing-valve. In order that the reducing-valve d may be set or adjusted to respond to any desired pressure, the vessel a is shown as provided with a removable plug d^4, through which access may be had to the adjusting-stem d^5 of said valve. It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform so that the supply of gas in the pipes is properly

controlled, *the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted*" (italics mine).

From the foregoing, it is evident that Claude & Hess intended and desired, and that the intention and desire is elaborately expressed in their patent, that automatic means shall be interposed between the chamber containing the solvent *b* saturated with acetylene under pressure and the ordinary valve c^3 which directly controls the burners, so that the acetylene gas can pass through the valve c^3 and pipe *c* to the burners "UNDER A SUBSTANTIALLY UNIFORM PRESSURE ONLY SLIGHTLY ABOVE THE ATMOSPHERE PRESSURE," SAID "PRESSURE BEING SUBSTANTIALLY THE SAME WHEN THE RECEPTACLE IS FULLY CHARGED AS WHEN IT IS NEARLY EXHAUSTED."

The claims can not be broader than the disclosure of the specification and drawings, and, as a matter of fact, are limited in exact accordance with that disclosure, as hereinabove analyzed; and to correspond to the essence, principle, and theory of the specification and drawings of this patent.

Not only does the term "reducing-valve" possess unques-
30 tionably the technical signification of an automatic device to vary the outlet it controls in accordance with the pressure upon the supply side of same, so that a uniform pressure will be maintained upon the discharge side of said valve, no matter how the pressure upon the supply side may vary, but the specification of the Claude & Hess patent in suit explicitly recognizes (lines 95-97, page 1) that the pressure in the receiver *a* will decrease as it becomes emptied of gas, and to obviate this and in order to obtain the desideratum set forth in the specification of the Claude & Hess patent that the pressure at the burners shall be "substantially the same when the receptacle is fully charged as when it is nearly exhausted" (page 2, lines 17-19), the patentees provided the reducing-valve *d*. The Claude & Hess patent in suit itself gives a definition of the term "reducing-valve" and itself defines precisely what is meant in claim 1 by the expression "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" in the following language in the specification (page 2, lines 13-20): "It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

The Claims.

The claims of this Claude & Hess patent, No. 664,383, are all drawn in such manner as clearly to be in accord with the object disclosed by the specification of permitting the emission of gas under a substantially uniform pressure, which pressure is "substantially the same when the receptacle is fully charged as when it is nearly exhausted," claims 2, 3, 4, 5, and 6 being each explicitly limited to the use, in combination with other elements, of "a reduc-

ing-valve," and claim 1 being limited to some similar automatic valve by the inclusion in that claim of the element denominated therein "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." As pointed out above, any means for automatically permitting the escape of gas from the solvent *b* to the pipe *c* leading to the burners at substantially uniform pressure can be properly denominated a reducing valve. Claim 1 is limited like all the other claims of this patent to the use of a reducing-valve. In any event, claim 1 and each of the other claims requires the inclusion of automatic
31 means for controlling the outlet for the acetylene gas from the solvent *b* "whereby the gas may escape therethrough at substantially uniform pressure," and when the foregoing quotations from the specification of this Claude & Hess patent, No. 664,383, are considered, it will be perceived that each of the six claims of this Claude & Hess patent is most aptly phrased to limit the patent to structure adapted to accomplish the precise object in view explained at greatest length in the specification—briefly, to control the passage of the acetylene gas from the solvent *b* to the burners "under a substantially uniform pressure only slightly above the atmospheric pressure," said "pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

Taking up the claims of this Claude & Hess patent separately, we find the analysis of same to be as follows:

Claim 1.

So far as structure is concerned, claim 1 is for (*a*) "a closed vessel" * * * (*b*) "having an outlet" * * * and (*c*) "means for controlling said outlet." The other language in the claim limits this "means for controlling said outlet" to automatic means; and, if said limitation requiring the "means for controlling said outlet" to be automatic is not given effect, the structure defined by the said claim is anticipated by any bottle having a cork in it or by a jar such as is used for preserves or jam. Claim 1 is in form neither for a process nor for an apparatus nor for a true article of manufacture nor for a composition of matter, as it does not directly include any of the features embodied in certain descriptive phrases found in it, but includes directly only the three elements hereinbefore mentioned, namely, (*a*) "a closed vessel" * * * (*b*) "having an outlet" * * * and (*c*) "means for controlling said outlet," which means is clearly limited to automatic means. The claim concludes with the words "substantially as described," which refers to the specification for information as to the nature of the element described in said claim as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure," said element having been described in the specification in language which said claim practically quotes, as follows: "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for

this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially
32 uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." The "reducing-valve" mentioned in this quotation, which is repeated practically verbatim in this claim 1, is mentioned explicitly seventeen times in the specification and claims and is additionally referred to therein and is more prominent in the specification and claims than any other one item mentioned therein.

When gas is introduced under pressure into solvent *b* of this patent, its tendency is to escape from the receptacle *a*. If allowed to flow directly out of valve c^3, it will do so at gradually decreasing pressure. By this is meant that, if the reducing-valve *d* of the Claude & Hess patent be omitted, the gas charged under pressure into solvent *b* will, when the valve c^3 is for the first time opened, rush out with a mighty force and noise, but that force will gradually decrease because of the pressure of the acetylene in the solvent *b* gradually becoming less, and the result is that with the use only of a valve like the valve c^3 of the Claude & Hess patent without the interposition between it and the solvent *b* of the reducing-valve *d* the gas will be emitted at gradually decreasing pressure and not "at substantially uniform pressure," and, furthermore, the gas will not be emitted at a pressure "only slightly above the atmospheric pressure"; but, on the contrary, when the charged tank or "package" is for the first time opened, the exit of the gas will be at a pressure very far above atmospheric pressure, and that pressure will not be uniform, but will gradually decrease, in violation of the theory of the specification and claims of the Claude & Hess patent, the desideratum of which is to deliver the gas at the burners "under a substantially uniform pressure only slightly above the atmospheric pressure." This result in the Claude & Hess patent is described in the specification, shown in its drawings, and mentioned in its claims, being secured by the use of the automatic device known as a reducing-valve, which is a valve commonly known in the arts and is a valve so constructed as automatically to vary the outlet it controls in accordance with the pressure upon the supply side of the same, so that a uniform pressure will be maintained upon the discharge side of said valve, no matter how the pressure upon the supply side may vary.

Claim 2.

Claim 2 is radically unlike claim 1 in that it positively, i. e., directly includes as elements of the combination the following:
33 (*a*) "a solvent of acetylene contained within said vessel"; (*b*) "and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution"; and (*c*) "a reducing-valve" at a point in said package "above the solvent." The foregoing are in claim 2 combined with "a tight shell or vessel."

Claim 2 is different from claim 1 as above stated, because it claims

the solvent as an element of the combination and because it claims the acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution as another element of said combination. In this respect claim 2 is quite unlike claim 1, which does not claim the solvent or the supersaturated solution of acetylene produced by forcing acetylene into the solvent under pressure, but merely states that the "closed vessel" of claim 1 contains those things. Those things constitute no part of claim 1, but are properly elements of claim 2.

Claim 2 is limited to the use of "a reducing-valve" and, furthermore, to the location of that reducing-valve "at a point above the solvent." The first of these limitations is in accord with that principle enunciated in the specification to which reference is hereinabove made that the desire of the patentees was to deliver the gas at the burners at substantially uniform pressure and at a pressure "only slightly above the atmospheric pressure," and the second-mentioned limitation is in accordance with the statement of the specification (line 26, page 1, et seq.) that it is one of the essentials of the invention of this patent that the outlet for the gas shall be "so positioned as to be normally above the level of said solution."

As pointed out above, the reason why the patentees regarded the location of the outlet for the gas "at a point above the solvent" as one of the essentials of the invention is because the specific gravity and physical characteristics of acetone and alcohol are such that these liquids naturally sink to the bottom of the vessel containing the "supersaturated solution," thus freeing a certain amount of acetylene gas, which, being lighter than the liquid solvent *b*, rises to the upper part of the chamber or vessel containing said "supersaturated solution"; and, if said outlet for the gas is located lower than the level of the liquid solution, the gas when emitted will carry the liquid with it, this operation being termed "blowing" of the solvent. "Blowing" of the solvent is objectionable for various reasons, among which may be mentioned the waste of it and, also, the untimely loss of the wasted solvent.

34 **Claim 3.**

Claim 3 is for the apparatus described in the specification "for storing gas and delivering it at a substantially uniform rate," and the claim is limited to details such as requiring that there shall be "a valved inlet-pipe a^2" and that same shall extend "to a point near the bottom of the chamber *a*," and the further requirement that there shall be "a horizontal diaphragm d^2 extending across the chamber in its upper portion and provided with a passage d^3." In addition, this claim is limited by the requirement of "a reducing-valve *d*," and is further limited by the requirement that that reducing-valve shall be applied to the opening d^2 in the above-mentioned horizontal diaphragm d^2 and by the requirement of a separate "valved outlet-pipe *c* through which the gas after passing the reducing-valve may escape to the main or distributing pipes."

Claim 4.

This claim is specifically limited to "an inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent." It is furthermore limited by the requirement that the "outlet-opening from the solvent-chamber" shall be located "above the level of the solvent." This claim is additionally limited to "a reducing-valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity," this being explicitly required as part of the structure.

Claim 5.

In some respects claim 5 is like claim 2, and, like it, is limited by the express requirement of the use of "a reducing-valve." Claim 5 contains, however, a specific limitation not found in claim 2, namely, the requirement that the solvent shall be "acetone." This claim, furthermore, resembles claim 2 by containing the limitation that said reducing-valve shall be applied to an opening located "above the level of the solvent." The reason for this location has been commented on in connection with claim 2 and likewise explained in connection with the statement in the specification (line 27, page 1) that it is one of the essentials of this alleged invention that the "outlet for the gas" shall be "so positioned as to be normally above the level of said solution."

Claim 6 is for the holder for gas described in the specification, and is limited by its expressed requirement to the use of "a reducing-valve" and, furthermore, by its requirement that said reducing-valve shall be applied to a gas outlet located "in the upper part of said chamber." Moreover, the claim requires a construction in which there shall be present not only the reducing-valve *d* of the Claude & Hess patent in suit, but, also, a valve such as the valve c^3 of that patent, which latter valve the claim refers to as "means for temporarily sealing the vessel completely." In other words, this claim requires two valves, and, in this respect, differs from all the other claims of the patent except claim 3, and, for this reason, is more limited than any of the other claims of this patent except claim 3.

Having thus analyzed each of the six claims of the Claude & Hess patent, No. 664,383, it will probably be useful to compare them with a gas-package which admittedly does not infringe said Claude & Hess patent, so as to place before the court an objective example of non-infringement, which may serve as a criterion later to determine whether or not defendant's gas-package comes within the terms of any of the claims of the Claude & Hess patent and, therefore, infringes same, there being, of course, no infringement of a patent if the defendant's device does not fall within the scope of the claims.

The drawing attached to this affidavit marked "Defendant's Exhibit No. 1" places before the court an indisputable example of non-infringement of complainants' patent in suit, No. 664,383, since,

assuming the tank shown in said drawing to contain a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, the valve c^3 shown in the drawing as located in outlet-passage c is neither "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" nor the mechanical equivalent for such means. The valve c^3 of said drawing depicts means only for controlling said outlet so that the gas may escape at gradually decreasing pressure. The gas-package of the drawing marked "Defendant's Exhibit No. 1" is therefore, not an infringement of claim 1 of the Claude & Hess patent, No. 664,383, not being within the scope of said claim and not constructed in accordance therewith. Comparing claim 2 of the Claude & Hess patent, No. 664,383, with the drawing attached hereto marked "Defendant's Exhibit No. 1" and assuming the tank shown in that drawing to contain "a solvent of acetylene" and "acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution", the gas-package depicted by Defendant's Exhibit No. 1 is clearly seen not to be constructed in accordance with said claim and not to be
36 within the scope of said claim nor an infringement of said claim, because of the omission therefrom of the "reducing-valve" specifically required by said claim, there being no mechanical equivalent for said reducing-valve in the tank shown in the drawing marked "Defendant's Exhibit No. 1", the valve c^3 not being an automatic valve, but one adapted to be operated only manually, and not being adapted to deliver the gas on the discharge side leading to the burners "at substantially uniform pressure", but only at gradually decreasing pressure. Claim 3 of the Claude & Hess patent, No. 664,383, requires a structure widely different from that shown in the drawing attached hereto marked "Defendant's Exhibit No. 1", assuming the tank of said drawing to contain "a supersaturated solution" of gas. In the first place, the apparatus of said drawing is not adapted "for storing gas and delivering it at a substantially uniform rate", but only at a gradually decreasing rate. In the second place, the "valved inlet-pipe a^2" is not found present in the tank of the drawing, and, therefore there is no "valved inlet-pipe a^2" in the tank of the drawing "extending to a point near the bottom of the chamber a". In the third place, the tank of the drawing omits the "horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2". In the fourth place, the "reducing-valve d applied to said opening d^2 is absent from the tank of the drawing marked "Defendant's Exhibit No. 1". The only elements of claim 3 present in the tank of the drawing marked "Defendant's Exhibit No. 1" are the "shell or vessel a" and the "valved outlet-pipe c". Claim 4 of said Claude & Hess patent, likewise, calls for a structure widely differing from that shown in the drawing hereto attached marked "Defendant's Exhibit No. 1", the tank of said drawing not having "an inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent" nor being provided with a separate chamber for the solvent and not having "an outlet-opening from the solvent-

chamber above the level of the solvent". Moreover, the tank of said drawing does not possess "a reducing-valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity". The tank of the drawing has neither a reducing-valve nor the equivalent thereof, and the valve c^3 of the drawing will not serve "to permit escape of the gas in regulated and uniform quantity", but will allow it to escape only in gradually decreasing quantity. Comparing claim 5 of said patent with the tank of the drawing marked "Defendant's Exhibit No. 1" and assuming said tank to contain a "charge of acetone" and "a volume or body
37 of gas dissolved by and compressed and contained within the solvent", we find that there is not present in said tank "a reducing-valve" nor one applied "above the level of the solvent". The tank of said drawing is, therefore, clearly outside the scope of claim 5 and not constructed in accordance therewith and can not be an infringement thereof. Comparing claim 6 with the tank of the drawing marked "Defendant's Exhibit No. 1", we find that the tank of said drawing differs widely from the structure required by said claim, since said claim requires the division of the gas-holder into two chambers just as described in the specification of the Claude & Hess patent and as illustrated in the drawing of that patent, one of said chambers being intended to receive a gas solvent, the tank of said drawing not being divided into chambers, but having only one chamber. Moreover, it does not possess an outlet for the gas located in the upper part of the solvent-chamber, nor has it "a reducing-valve applied to said outlet". Assuming the tank of said drawing to contain a gas solvent adapted to receive a charge of gas under pressure and to form therewith a supersaturated solution, the only elements of said claim that the tank shown in Defendant's Exhibit No. 1 contains are a "tight vessel" and "means for temporarily sealing the vessel completely", namely, the valve c^3.

The tank that has just been compared with the claims of the Claude & Hess patent, No. 664,383, and which has been shown not to be constructed in accordance with the claims of that patent (its departure from resemblance to the drawings and specification of that patent is even more noteworthy) is the tank or gas-package that in complainants' evidence is denominated that of complainants. Complainants' evidence shows large sales of gas-packages or tanks like those depicted in the drawing attached hereto marked "Defendant's Exhibit No. 1" under the name of "Prest-O-Lite" tanks; but none of these tanks is made under the Claude & Hess patent, No. 664,383. They are simply unpatented.

Defendant's Tank.

Comparison of defendant's tank, which is depicted in the drawing hereto attached marked "Defendant's Exhibit No. 2" and made in accordance with United States patent No. 987,000, dated March 14, 1911, owned by defendant, with the claims of the Claude & Hess patent in suit, No. 664,383, exhibits greater difference than even the "Prest-O-Lite" tanks from the patent in suit. All the differ-

ences that show that the "Prest-O-Lite" tanks depicted in
38 Defendant's Exhibit No. 1 are not made in accordance with the Claude & Hess patent, No. 664,383, and would not infringe that patent though made, used, or sold by any one other than complainants, can be pointed out likewise between defendant's tank or gas-package and the claims of the Claude & Hess patent in suit, No. 664,383, and additional differences besides exist, which add to the differentiation between defendant's tank or gas-package and that of the Claude & Hess patent in suit. As, however, defendant's package, depicted in the drawing hereto attached marked "Defendant's Exhibit No. 2," differs from the Claude & Hess patent in suit in all the respects in which the "Prest-O-Lite" tanks do, it can not infringe the Claude & Hess patent. The fact that defendant's gas-package or tank differs from the patent in suit in additional respects simply strengthens the case in favor of defendant.

Hereinabove the spirit, principle, and essentials of the alleged invention of the Claude & Hess patent in suit have been pointed out as found stated in the specification, and, after the summary thereof, it has, furthermore, been shown above that the claims of the Claude & Hess patent are aptly drawn to correspond with the spirit, principle, and essentials of the alleged invention as set forth in the specification in the patent in suit and its drawings.

Comparing the claims of the Claude & Hess patent in suit, No. 664,383, with the tank or gas-package of defendant, which is depicted in the drawing hereto attached marked "Defendant's Exhibit No. 2", we find that defendant's said tank departs in principle and function, as well as structure, from the alleged invention described and claimed in the patent in suit in various respects, which will now be pointed out in connection with each of the claims of said Claude & Hess patent, No. 664,383.

Claim 1. Although claim 1 is merely for a structure comprising "A closed vessel * * * having an outlet * * * and means for controlling said outlet", said means being indicated in the claim as being in the nature of an automatic pressure regulator, yet, if the stated contents of the vessel consisting of "a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure" be erroneously conceded to be an element of that claim, defendant's gas-package or tank differs from said claim in that it is not provided with the final element of that claim nor any equivalent therefor, said element being described in said claim as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described."
39 Defendant's tank is provided only with the needle valve 8 of defendant's patent No. 987,000, dated March 14, 1911, which can not so regulate the passage of the gas that its escape will be "at substantially uniform pressure," but said needle valve is adapted only to allow the escape of the gas to be at gradually decreasing pressure. The phrase in claim 1 of said Claude & Hess patent "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described" so plainly carries us to lines 56 to 63 of page 1 of the speci-

fication of the patent that the last element of claim 1 of the patent can only be understood to mean a reducing-valve; and there is no reducing-valve nor equivalent therefor in defendant's tank. The last element in claim 1 of the patent reads: "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure"; and the language of the specification referring to the same subject-matter is substantially identical, and reads as follows (page 1, line 50 et seq., of the specification): "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use."

As pointed out above, unless the final element of claim 1 of this Claude & Hess patent is interpreted to call for an automatic pressure regulator, such as the device common in many arts known as a reducing-valve, it will be invalid, because anticipated by any bottle with a stopper, because, so far as said claim defines structure, said claim is for nothing more than the following structure: "A closed vessel * * * having an outlet * * * and means for controlling said outlet." To say that a structure is long or short, round or rectangular, narrow or broad, for instance, will characterize the structure, but stating the contents of the structure in no wise characterizes, limits, defines, or qualifies the structure. I have examined thousands of claims in patents for inventions and am thoroughly conversant with the mode of drawing same and know that it is universally understood that mere descriptive phrases in a claim, such as that beginning with the word "containing" in claim 1 of the Claude & Hess patent in suit and continuing to the word "pressure" therein, signify nothing in defining the structure patented, and that it is the structure only that is patented by a claim, which, like claim 1 of the patent in suit, improperly contains descriptive verbiage. As pointed out above, claim 2 of the patent in suit is properly drawn with respect to the inclusion therein of the solvent, and in this respect differs radically and properly from claim 1, In claim 2 the solvent is stated directly as an element of the combination, while in claim 1 it is merely mentioned in a descriptive way in connection with the structure.

Claim 2. Since claim 2 specifically mentions "a reducing-valve," it is well to bear in mind that a reducing-valve is a valve so constructed as automatically to vary the outlet it controls in accordance with the pressure upon the supply side of the same, so that a uniform pressure will be maintained upon the discharge side of said valve, no matter how the pressure upon the supply side may vary. For instance, the specification of the Claude & Hess patent says (page 1, lines 95-97): "the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom." As hereinbefore pointed

out, the main theory or principle of the Claude & Hess patent in suit is that (page 1 of the specification, line 50 et seq.) : "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure." When the tank is full of acetylene gas, the pressure is exceedingly strong and far above atmospheric pressure, as the specification of the Claude & Hess patent in the passage at line 95, page 1, quoted above states that the pressure of the gas within the receiver decreases as the gas passes out therefrom. In the operation of an apparatus like that of the Claude & Hess patent minus the reducing-valve *d*, the desired uniformity of pressure at the burners would be absent. The Claude & Hess specification says that this uniformity is desirable, and adds (page 1, line 55 et seq.) : "and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use."

Defendant's tank is not provided with a reducing-valve, nor any equivalent therefor, nor any means for automatically regulating the pressure of the gas as it escapes from the solvent-chamber or from the tank itself. Since claim 2 is additionally limited by prescribing that such reducing-valve shall be located "at a point above the solvent," it is material to add that defendant's valve 8 (which is not a "reducing-valve" nor the equivalent therefor) is not
41 located "at a point above the solvent," but at a point below the level of the solvent, and approximately about the middle of the solvent. As hereinabove pointed out, the specification of the Claude & Hess patent in suit says that it is one of the essentials (line 27, page 1) of the alleged invention of that patent that the "outlet for the gas" shall be "so positioned as to be normally above the level of said solution." So very essential to the practice of their alleged invention did the patentees, Claude & Hess, regard the locating of the outlet for the gas at a point normally above the level of the solvent that that limitation to the location of the outlet for the gas, namely, above the solvent, is found in claims 2, 3, 4, 5, and 6. As hereinbefore pointed out, the reason why Claude & Hess regarded said location for the gas outlet as important and, as the specification says, "essential" (line 27, page 1) is that, when using either of the solvents mentioned in the specification of the patent in suit, that is to say, either of the solvents contemplated by Claude & Hess, the solvent would "blow" simultaneously with the emission of the gas if the gas outlet were not located above the level of the solvent. The evidence on behalf of defendant in this case shows, however, that it does not use either acetone or alcohol as its gas solvent (which are the only solvents mentioned in the specification of the patent in suit), but that it uses a different liquid as its solvent called by the name "Terpeline," which possesses characteristics and properties unlike those of acetone and alcohol, one of its properties being that, because of its nature and consistency, it does not "blow" with the gas even

though the gas outlet is located below the level of the solvent. Whether essential or not, the limitation in claims 2, 3, 4, 5, and 6 that the gas outlet shall be located above the level of the solvent is a limitation by which the patentees are bound, because clearly expressed in said claims. That said limitation is an essential one is adequately shown by the fact that either of the two solvents contemplated by the specification of the patent in suit, i. e., either acetone or alcohol, will "blow" with the gas if the gas outlet is located below the level of the solvent. That is why we find in the "Prest-O-Lite" tanks, depicted in the drawing marked "Defendant's Exhibit No. 1," that the outlet-passage *c* is located near the part of the side wall of the tank bearing the words "This side up." This arrangement of a "Prest-O-Lite" package locates its gas outlet "at a point above the solvent." This location is necessary in the "Prest-O-Lite" packages, because of the use therein of acetone as the solvent. The fact that defendant with its solvent "Terpeline" finds it unnecessary to locate its gas outlet "at a point above the solvent" is demonstrated
42 by the fact that defendant's tank is constructed (as shown in the drawing marked "Defendant's Exhibit No. 2") with its gas outlet located in the middle of the solvent and below the level of the solvent.

For the reasons that defendant's tank or gas-package is not provided with a reducing-valve, or the equivalent therefor, and is not provided at a point above the solvent with a reducing-valve or any kind of a gas outlet, defendant's gas-package or tank is clearly outside the scope of claim 2 of the patent in suit and not an infringement thereof.

Claim 3. Defendant's gas tank or package is not constructed in accordance with claim 3, and differs therefrom in a number of items, and, therefore, is not an infringement thereof. For example: Defendant's tank or gas-package is not an "apparatus for storing gas and delivering it at a substantially uniform rate," but defendant's apparatus delivers its gas at a gradually decreasing rate. Defendant's tank or package is not provided with "a valved inlet-pipe a^2," and is, therefore, unprovided with such a pipe "extending to a point near the bottom of the chamber *a*." Defendant's tank likewise omits the "horizontal diaphraghm d^3," and, therefore, has no such diaphragm in the "upper portion" of the chamber *a*. Moreover, defendant's tank possesses no reducing-valve.

Claim 4. Defendant's tank or gas-package differs widely from the apparatus claimed by claim 4 and is outside of its scope and, therefore, not an infringement therof. For instance: Defendant's tank possesses no "inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent." Nor has it "an outlet-opening from the solvent-chamber above the level of the solvent." This claim calls for two chambers, while defendant's tank has but one. Furthermore, the claim demands "a reducing-valve" "serving to permit escape of the gas in regulated and uniform quantity." Defendant's tank has no reducing-valve and no other means "serving to permit escape of the gas in regulated and uniform quantity."

29

Claim 5. Three plain limitations absolve defendant's gas-package from any charge of infringement of claim 5. This claim is limited to the use of acetone as the solvent; but defendant does not use acetone, but "Terpeline." It would be outside the scope of this claim if defendant used alcohol as a solvent, notwithstanding that the specification of the Claude & Hess patent mentions alcohol as an alternative for acetone as a solvent. Defendant, however, uses neither, but its own solvent, which possesses its own characteristics and advantages over acetone or alcohol. Furthermore, defendant's tank is
43 outside the scope of this claim, because there is not found in defendant's tank a reducing-valve, or an equivalent therefor, nor "an opening extending to the interior of the holder above the level of the solvent."

Claim 6. This claim calls for a tank having two chambers, the lower one to receive a gas solvent. Defendant's tank has but one chamber. Defendant's tank is not provided with "an outlet for the gas in the upper part of said chamber," as required by said claim. The outlet thus mentioned in the claim is required by the claim to be in the upper part of the lower chamber, but, although defendant's tank has no such lower chamber and, therefore, can not have the outlet mentioned in the claim so located, it may be added that the outlet from defendant's tank is not located in the upper part of its one chamber, but at the central part thereof. The claim, also, requires the use of a reducing-valve; but there is no reducing-valve or equivalent therefor in defendant's tank. This claim, moreover, demands two valves, namely, said reducing-valve applied to the solvent chamber and a valve for the tank as a whole called in the claim "means for temporarily sealing the vessel completely." Defendant's tank needs and has but one valve, because it possesses but one chamber, said valve being the needle valve marked "8" in defendant's patent No. 987,000 and in the drawing hereto attached marked "Defendant's Exhibit No. 2."

Summary as to Infringement.

From the foregoing, it is evident that claims 3, 4, and 6 demand a double-chambered construction like that depicted in the drawings in the Claude & Hess patent, No. 664,383, and that defendant's tank is widely different therefrom. From the foregoing, it will furthermore appear that defendant's gas-package is widely different from that claimed by claim 5, because that claim is specifically limited to the use of acetone as a solvent, while defendant uses a different solvent called "Terpeline," which possesses properties of its own, and because the outlet from defendant's tank can be and is located below the level of the solvent, due to the fact that defendant uses a solvent other than and different from acetone and is, therefore, not obliged to locate its gas outlet above the solvent, and for the additional reason that defendant does not use a reducing-valve or the equivalent therefor. Defendant does not infringe claim 2, because defendant's tank or gas-package is not equipped with a reducing-valve or the equivalent therefor, nor is its valved gas outlet located

"at a point above the solvent." Defendant's tank or gas-
44 package does not infringe claim 1, because defendant's package is not provided with means for controlling the gas outlet so that the gas can escape therethrough at substantially uniform pressure nor the equivalent therefor, defendant's tank being equipped with a valve of different type patented to it by the Lukens patent No. 987,000, dated March 14, 1911, which is not adapted to permit the escape of the gas at substantially uniform pressure, but it can only allow the gas to escape at gradually decreasing pressure.

The specification of the patent in suit mentions specifically but two solvents, namely, alcohol and acetone (page 1, lines 76-78), and, since the opinion of Judge Quarles in the case of Commercial Acetylene Company v. Avery Portable Lighting Company, 166 Fed., 907, sustaining claims 1 and 2 of the Claude & Hess patent in suit, No. 664,383, is based upon the use of acetone as the solvent, because of its "wonderful properties and advantages," the term "solvent" in claims 1, 2, 4, and 6 must be construed as referring to acetone alone, and not indefinitely to any and all solvents that might later be invented or discovered. In this simple view of the disclosure of the Claude & Hess patent, defendant will not infringe any of the claims that mention broadly a solvent, because defendant does not use acetone, and defendant cannot infringe claim 5, because that is specifically limited to the use of acetone as the solvent, defendant using "Terpeline," not acetone nor alcohol.

The Prior Art.

Only claim 5 of the Claude & Hess patent, No. 664,383, specifically mentions acetone as the solvent. Claims 1, 2, 4, and 6 use the term "solvent" broadly, and, therefore, include alcohol as well as acetone as the solvent that may be used. This is true, also, of claim 3, which refers to a "solution of gas." With the exception, therefore, of claim 5, the solvent contemplated and within the scope of each and every claim of this Claude & Hess patent in suit may be either alcohol or acetone, as both are mentioned in the specification (page 1, lines 76-78), and the broad term "solvent" reads as well on alcohol as on acetone. It is axiomatic that that which will infringe if later will anticipate if earlier.

Henry's Law.

Any one not a chemist might not know that a gas can be dissolved in a liquid. Nevertheless, it is well known that such is the
45 fact. Just as sugar can be dissolved in coffee and just as many solids can be dissolved in water and just as nearly all solids can be dissolved in liquids (the appropriate liquid or liquids being used for each particular kind of solid), so, also, can gases be dissolved in liquids. The solubility of gases in liquids has been known for a very long time, and so early as 1803 an eminent English chemist named William Henry announced the further discovery that the quantity of gas that any liquid will dissolve depends

upon the amount of pressure to which the gas is subjected. This principle appertaining to the solubility of gases in liquids is known as "Henry's Law," and statements of it are found spread broadcast through the encyclopedias and other literature of the subject. For instance, "The New International Encyclopedia," published in 1903 by Dodd, Mead & Company, of New York, states it in the following very clear and brief form:

"The amount of any gas absorbed by any liquid is proportioned to the pressure exercised upon the gas."

"Acetylene: The Principles of Its Generation and Use," by Leeds & Butterfield.

Published in London in 1903.

That acetylene gas, like other gases, can be dissolved in liquids has, also, long been known, as is shown by the elementary text book on acetylene, of which Leeds & Butterfield are the authors, 1903 edition, which on page 146 states that E. Davy in the year 1836 discovered that under substantially normal atmospheric pressure water will dissolve and absorb a volume of acetylene gas equal to its own volume.

A certified copy of the part of the foregoing publication referred to by me will be filed herewith designated "Defendant's Exhibit No. 3."

"Annales de Chimie et de Physique."

Published in Paris, France, in 1866.

This 1866 publication, in book form, a copy of which has been in the Scientific Library of the United States Patent Office since March 2, 1867, is unimpeachable evidence that long prior to the filing of the application for patent in suit the solubility of acetylene in a large number of different liquids, including alcohol (mentioned in the specification of the Claude & Hess patent in suit, page 1, line 77), was well known, that publication at page 425 (Volume IX.) stating that acetylene gas is soluble in different solvents at about 18 degrees C., as follows: Water, carbon disulphide, and amylene hydrate dissolve about their volume of acetylene; illuminating
46 petroleum, 1½ its volume; essence of turpentine and carbon perchloride, 2 volumes; amylic alcohol and styrolin, 3½ volumes; chloroform and benzine, 4 volumes; and crystallizable acetic acid and absolute alcohol, nearly 6 volumes.

This being a French publication, it is easy to understand where Claude & Hess (who were both residents of France, lines 2-5, page 1 of the patent in suit) obtained their information as to the solubility of acetylene gas in alcohol, etc. This accounts, also, for the fact that the claims of the patent in suit are all limited to automatic means, such as a reducing-valve, for controlling the gas outlet, whereby the gas may escape therethrough at substantially uniform

pressure. Neither the claims of the patent in suit nor its specification assert, state, imply, or claim that the alleged invention of that patent resides in dissolving acetylene gas in alcohol or acetone, the solvents mentioned in the specification of the patent in suit (line 77, page 1), or in the discovery by them that acetylene gas is soluble in alcohol or acetone, but the principle and spirit of the alleged invention of the patent in suit is manifest from the specification, as pointed out above, and by reason of the specific limitations contained in its claims to reside in the operation of automatic means for permitting the gas to escape at substantially uniform pressure and in the location of such means and the gas outlet at a point above the level of the solvent.

A certified copy of the part of the foregoing publication referred to by me will be filed herewith designated "Defendant's Exhibit No. 4."

"Journal of the Franklin Institute,"

Volume 139, Page 324.

Published May, 1895.

This May, 1895, publication contains an article or paper entitled "The Carbides and Acetylene Commercially Considered," by T. L. Willson and J. J. Suckert, Ph. D., which, in the midst of an elaborate exposition of the nature and qualities of acetylene gas, says: "It is soluble in water in about the same proportions as carbon dioxide, that is, at 64° f. water will absorb its own volume of the gas. Absolute alcohol and glacial acetic acid dissolve about six times their volume."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith designated "Defendant's Exhibit No. 5."

47 The Dickerson Patent, No. 662,258, Dated November 20, 1900.

(Application Therefor Filed April 8, 1897.)

So well known at the date, April 8, 1897, of the filing of the application for said Dickerson patent was the fact that acetylene gas under pressure will dissolve in liquids, such as alcohol and acetone (the only solvents mentioned in the specification of the Claude & Hess patent in suit, No. 664,383, page 1, line 77), that the specification of said Dickerson patent disclaims any merit in the use of that familiar knowledge, and says that his invention resides in the utilization before dissolving the acetylene in such solvents as alcohol, acetone, or fusel-oil of such excessive pressure applied to the acetylene gas as will liquefy same according to the well-known process, the Dickerson patent saying (lines 45-52): "I do not claim to be the first to discover that acetylene can be absorbed by liquids, my in-

vention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusel-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent."

A certified copy of said Dickerson patent will be filed herewith, designated "Defendant's Exhibit No. 6," and a certified copy of the file-wrapper and contents of the application for said Dickerson patent, No. 662,258, will be filed herewith, designated "Defendant's Exhibit No. 7," showing the application for said Dickerson patent, No. 662,258, to have been filed in the United States Patent Office on April 8, 1897, and that the oath to said application was executed on April 2, 1897.

The Dickerson & Suckert Patent, No. 582,274, Dated May 11, 1897.

(Application Filed March 4, 1896.)

This patent discloses a tank A containing compressed acetylene gas, to which is attached a reducing-valve E, for the purpose of automatically controlling the escape of the gas to the burners at substantially uniform pressure. The specification of this Dickerson & Sucket patent shows the use of reducing-valves for such purposes as that to which the reducing-valve *d* of the patent in suit is applied to be well known, and, furthermore, that such appliances are technically known as "reducing-valves" and describes their operation, its language being as follows: "In applying liquefied or compressed acetylene gas to the illumination of houses or for other purposes where the gas must be reduced in pressure to enable its prac-
48 tical application it is necessary to effect the reduction in pressure by mechanical appliances technically known as 'reducing-valves' and ordinarily operating by means of a diaphragm or piston or float, which, when the reduced pressure exceeds the prescribed limit, closes off, by means of suitable levers, the valve feeding the compressed gas to be reduced in pressure."

A certified copy of said Dickerson & Suckert patent will be filed herewith, designated "Defendant's Exhibit No. 8," and a certified copy of the file-wrapper and contents of the application for same will be filed herewith, designated "Defendant's Exhibit No. 32."

Abandoned Claude & Hess Application for Method or Process Patent.

Documentary evidence of the most cogent probative force that claim 1 of the patent in suit, No. 664,383, must be restricted and limited in its interpretation and construction to the use of automatic means such as the reducing-valve *d* referred to in the specification (and, a fortiori, claim 2, which specifically mentions a reducing-valve) is found in the certified copy of the file-wrapper and contents of the abandoned Claude & Hess application for patent for Process or Method of Storing Acetylene Gas for Distribution, Serial No. 625,581, filed herewith and designated "Defendant's Ex-

hibit No. 9" and the certified copy of the proceedings on appeal of said method application to the Board of Examiners-in-Chief and the renewal thereof, filed herewith and marked "Defendant's Exhibit No. 10," and in the certified copy of the proceedings on appeal of said method application to the Commissioner of Patents in Person, filed herewith and marked "Defendant's Exhibit No. 11," the last-mentioned exhibit, furthermore, showing that said application was abandoned by the applicants, Claude & Hess, by failure to take an appeal from the decision of the Commissioner of Patents to the Court of Appeals of the District of Columbia.

In the brief filed by the attorneys for Claude & Hess in support of their appeal of this method application to the Board of Examiners-in-Chief are found the following admissions: "It is conceded that the idea of charging liquid solvents of different gases with such gases is old and well known, and further that the quantity of any given gas which will be taken up by a given solvent increases with increase of the pressure under which the gas is introduced. * * * When such solvent is charged with the gas under pressure, a supersaturated solution is produced, and, as above indi-
49 cated, the broad idea of making a supersaturated solution of different gases with their solvents is a well established scientific possibility or fact. It may also be admitted that in the case of such supersaturated solution, the gas above or beyond the quantity required to effect such saturation will, if the upper portion of the vessel be vented, separate out of the solvent, and escape or flow off."

Defendant's Exhibits Nos. 9, 10, and 11 show that this application of Claude & Hess for a method or process patent was at all times rejected by the Patent Office and, on successive appeals, by the Board of Examiners-in-Chief and the Commissioner of Patents in Person, and thereupon became abandoned by reason of the failure of Claude & Hess to take a further appeal to the Court of Appeals of the District of Columbia. An examination of the claims presented in this abandoned application of Claude & Hess for a method patent, and particularly those claims that were appealed to the higher tribunals of the Patent Office, will show that there is but one differentiation between them and claim 1 of the Claude & Hess apparatus patent in suit, No. 664,383, and that that differentiation is the reducing-valve referred to in claim 1 of the patent in suit as means for controlling the gas outlet whereby the gas may escape therethrough at substantially uniform pressure. Driven to the wall by the prior art cited against the application for said method patent and forced to make the admissions regarding the prior art quoted above from the brief of the attorneys for Claude & Hess on appeal, the applicants for said method or process patent found themselves confronted, when their brief for the Commissioner of Patents on their final appeal was being prepared, by a situation in which they could see no hope of obtaining a patent for their alleged method or process of storing acetylene gas over the conceded prior art unless the reducing-valve of the apparatus application, which eventuated in the patent in suit, was imported into the claims for the method;

and, for that reason, the attorneys for Claude & Hess in their brief for the Commissioner of Patents on said final appeal said: "It is proper to say, however, that in our judgment the illustration contained in the apparatus case or a portion thereof should be reproduced in this," and said brief goes on to say that "the reducing-valve" of the apparatus application "is contemplated in the claims in this." When the peculiar phrasing of claim 1 of the patent in suit is borne in mind, it will be evident that it constitutes an abortive attempt to import the alleged process into a claim for an apparatus, but, even so, it contains the limitation of automatic means for regulating the escape of the gas so that its outflow will be at substantially uniform pressure. In order to save the admittedly anticipated claims of the method application, the attorneys for Claude & Hess prosecuting that method application endeavored to import into them the reducing-valve of the apparatus case. The Commissioner of Patents allowed the apparatus application, but rejected the method application, evidently because he found in the claims of the apparatus application limitations absent from the method claims, said limitation being the reducing-valve *d* of the apparatus application and the location of that valve and the outlet that it governs "at a point above the solvent." It was those distinctions which obtained the allowance of the apparatus application and the issuance of the patent in suit, No. 664,383, while it was the absence of those distinctions which caused the rejection of the method application, said method application being thereupon abandoned by Claude & Hess by failure to appeal to the Court of Appeals of the District of Columbia. The comparison of said method application and the claims therein presented to the Commissioner of Patents on the final appeal of that case and the rejection by the Commissioner of Patents of those claims graphically portrays the exact line of differentiation between the prior art and the patent in suit, the differences disclosed by the patent in suit from the prior art consisting solely in the provision of a reducing-valve or other automatic means for controlling the escape of the gas at substantially uniform pressure and the location of the gas outlet at a point above the level of the solvent.

I have examined the record in the case of Commercial Acetylene Company v. Avery Portable Lighting Company, 166 Fed., 907, and am, therefore, able to state that, while "Henry's Law," above mentioned, was casually referred to by defendant's expert, the prior art hereinbefore cited by me as anticipating or limiting the claims of the Claude & Hess patent in suit, No. 664,383, was not referred to in the testimony nor copies thereof introduced in evidence in the Milwaukee case to which reference has just been made, and that record, furthermore, shows that the Patent Office record relative to the application of Claude & Hess for Method of Storing Acetylene Gas, serial No. 625,581, in evidence here as Defendant's Exhibits Nos. 9, 10, and 11, was not offered in evidence until so late that complainant in that case objected to its reception in evidence on the ground of laches. In his opinion in that case Judge Quarles

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says (166 Fed., 909): "Complainant has objected at every stage to the introduction or use of such file-wrappers, and this objection was renewed on final hearing. For these reasons I do not
51 feel at liberty to consider the proceedings in the Patent Office touching the method application, or the claimed abandonment predicated thereon." For this reason, the important evidence found in the certified copy of the Patent Office record in connection with said method application of what Claude & Hess were obliged in con-ection with their method application to concede to be the prior state of the art was not considered by Judge Quarles in rendering his said decision. That important evidence is, so far as this case is concerned, new evidence, not considered by the Milwaukee court, and is to be found in the exhibits that will be filed with this affidavit marked, respectively, Defendant's Exhibits Nos. 9, 10, and 11.

In the foregoing I have shown that the broad term "solvent" used in all the claims of the Claude & Hess patent in suit, No. 664,383, except claim 5, reads upon alcohol as well as acetone, which are the only two solvents mentioned in the specification of the patent in suit (page 1, line 77). I have, furthermore, shown that in the French publication of the year 1866 entitled "Annales de Chimie et de Physique" is contained full information that at that date it was known that alcohol is a solvent for acetylene gas and that it will absorb nearly six times its own volume of acetylene gas, and I have suggested that it is probably from that French publication that the Frenchmen, Claude & Hess, obtained the knowledge stated in the specification of their patent in suit that alcohol is a solvent for acetylene gas. I have, furthermore, shown that the same information was published in May, 1895, in the "Journal of the Franklin Institute" in an article of which J. J. Suckert, Ph. D., was one of the co-authors. In addition, I have pointed out that acetone as well as alcohol as a solvent for acetylene gas is distinctly mentioned in the specification of the Dickerson patent, No. 662,258, in the following language: "I do not claim to be the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusel-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent."

Here is found a direct statement that acetone is a good solvent for acetylene gas under pressure. The statute (section 4886 R. S. U. S.) bars the grant of a patent to any one for anything known by others in this country "before his invention or discovery thereof," just the same as it bars the grant of a patent to any one for that which had been "patented or described in any printed publication in this or any foreign country before his invention or dis-
52 covery thereof." The validity of the claims of the patent in suit, so far as they depend for novelty upon the alleged discovery of Claude & Hess of the solubility of acetylene gas in

acetone,* is absolutely dependent upon whether or not Dickerson or any one else had knowledge of the solubility of acetylene gas in acetone under pressure prior to the earliest date that can be, under the law, accorded to the foreigners, Claude & Hess, who were the applicants for the patent in suit, namely, the date of the filing of the application for the patent in suit. Defendant's Exhibit No. 6 shows that the Dickerson patent, No. 662,258, issued November 20, 1900, more than a month earlier than the patent in suit, and Defendant's Exhibit No. 7 shows that the application for said Dickerson patent, No. 662,258, was filed April 8, 1897. Defendant's Exhibit No. 7, which is a certified copy of the file-wrapper and contents of the application for said Dickerson patent, No. 662,258, throws further light on knowledge by Dickerson and by one of his colleagues, Dr. J. J. Suckert, at a date even earlier than that on which said Dickerson application was filed of the solubility of acetylene gas in acetone under pressure. Said Dickerson file-wrapper and contents (Defendant's Exhibit No. 7) contains the following affidavits:

United States Patent Office.

Room 39.

In the Matter of the Application of Edward N. Dickerson, for Improvement Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

STATE OF NEW YORK,
City and County of New York, ss:

Edward N. Dickerson, being duly sworn, deposes and says: I conceived of the invention here in controversy as early as the year 1895. At that time the invention was reduced to practice by mingling liquefied acetylene with various solvents, among others, fusel oil, benzine, and others. They were so mingled in glass tubes,
53 and carefully studied with reference to increase in volume. The reduction to practice of the invention was at that time complete.

E. N. DICKERSON.

Subscribed and sworn to before me this 21st day of January, 1898.

[SEAL.] W. LAIRD GOLDSBOROUGH
Notary Public, New York Co.

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* Only claim 5 specifically mentions acetone—all the others read on alcohol as well as on acetone, as they use the term "solvent" broadly, and alcohol as a solvent for acetylene gas that would ordinarily, i. e., at atmospheric pressure, absorb six times its own volume of acetylene gas was known in France as far back as 1866, as shown above.

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United States Patent Office.

Room 39.

In the Matter of the Application of Edward N. Dickerson for Improvement Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

STATE OF NEW YORK,
City and County of New York, ss:

Julius J. Suckert, being duly sworn, deposes and says: I am co-inventor with Mr. Edward N. Dickerson in regard to several processes for the liquefaction of acetylene. In the year 1895, at his suggestion, I caused mixtures to be made of liquefied acetylene gas with a number of solvents, among others, fusel oil, benzine, and others. These mixtures were carefully studied with reference to the increase in volume and other physical facts at that time.

JULIUS J. SUCKERT.

Subscribed and sworn to before me this 21st day of January, 1898.

[SEAL.] W. LAIRD GOLDSBOROUGH,
Notary Public, New York Co.

Second Suckert Affidavit.

I have also read a draft of an affidavit prepared by Dr. Julius J. Suckert, which I am informed will be filed on behalf of the defendant in this suit, and which recites that he is the Julius J. Suckert who executed the affidavit dated January 21, 1898, filed in the Dickerson application which eventuated in patent No. 662,258; that, at the request of the said Dickerson, he, in April or
54 May, 1895, conducted a series of tests for the purpose of ascertaining the solubility of liquefied acetylene in various solvents, among them acetone; and that by said tests he then discovered that acetone had a capacity for absorbing many times its volume of acetylene, and that, when so absorbed, the resulting supersaturated solution was non-explosive. Accompanying and forming part of this affidavit is a sketch made by Dr. Suckert of the apparatus then used by him in making these tests. Among other things, said affidavit contains the following: "During those tests at that time with acetone as the solvent I observed that acetone had the capacity for absorbing many times its volume of acetylene, and formed when under pressure a supersaturated solution," the explosive character of the acetylene gas being neutralized by its being held in solution by the acetone.

It is clear from these affidavits of Dickerson and Suckert, taken with the statements found in the Dickerson patent, that it was known as early as the spring of 1895 that acetone is a solvent of acetylene, and that it also became known at that time that acetone will absorb

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many times its volume of acetylene, and that the resulting solution is comparatively non-explosive and a supersaturated solution.

By even the briefest tests with the apparatus shown and described in the Suckert affidavit, the capacity of acetone to absorb a very large volume of acetylene, making thereof a supersaturated solution, would have been at once revealed, and the plain statements in the description of the Dickerson patent, No. 662,258, disclose that it had been discovered prior to the filing of the application for the same that the absorption of acetylene under pressure in a liquid solvent, such as acetone, alcohol, or fusel oil, materially reduced the explosive character of the solution.

Watts's Dictionary of Chemistry, Published in 1875, Volume 2, Page 791.

In the edition of Watts's Dictionary of Chemistry published in 1875, Vol. 2, at page 791, is found the following:

"The amount of gas absorbed by a liquid on which it exerts no chemical action is dependent (1) on the specific nature of the gas and of the liquid; (2) on the temperature at which the absorption takes place; and (3) on the pressure under which the absorption takes place."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith marked "Defendants' Exhibit No. 12."

55 Wurtz's Dictionary of Chemistry, Published in 1875, Volume 1, Part 1, Page 43.

In this work, published as above stated, a copy of which has been in the Scientific Library of the United States Patent Office since October 17, 1891, is found, at page 43, Vol. 1, Part 1, the following: "Solubility of acetylene: Water, carbon disulphide, and amyl hydrid dissolve about their volume of acetylene gas; illuminating petroleum, 1½ times its volume; essence of turpentine and carbon perchloride, twice their volume; chloroform and benzine, 4 times their volume; crystallizable acetic acid and absolute alcohol, about 6 times their volume. (Berthelot, Ann. de Chim. et de Phys., (4), Vol. IX, p. 424.)"

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendants' Exhibit No. 13."

Treatise on Beverages, by Sulz, Published in 1888, Page 119.

In the Treatise on Beverages, by Charles Herman Sulz, published in New York in 1888, a copy of which has been in the Scientific Library of the United States Patent Office since July 7, 1891, is found, at page 119, the following:

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"We have already mentioned that water absorbs a greater amount of carbonic acid gas with increased pressure. It is found by experiment that this amount increases in proportion to the pressure as follows: At the pressure of one atmosphere (14.7 lbs.) the water will absorb its own volume; at the pressure of two atmospheres, twice its own volume; at three atmospheres, three times its own volume, and so on, until at about 540 lbs. to the square inch the carbonic acid gas itself becomes a liquid, as was discovered by Faraday in 1823."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendants' Exhibit No. 14."

Treatise on Beverages, by Sulz, Published in 1888, Page 123.

In the Treatise on Beverages, by Charles Herman Sultz, published in New York in 1888, a copy of which has been in the Scientific Library of the United States Patent Office since July 7, 1891, is found, at page 123, the following:

"As soon as the pressure in the cylinder gets diminished by letting escape its surface gaseous contents, a certain amount of the gas already absorbed by the liquid is eliminated in consequence of the decreased pressure."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendants' Exhibit No. 15."

56 Roscoe and Schorlemmer's "Treatise on Chemistry," Published in 1891, Pages 135 and 441.

In the standard "Treatise on Chemistry," by Roscoe and Schorlemmer, published in New York in 1891, a copy of which work has been in the Scientific Library of the United States Patent Office since December 5, 1892, is found the following:

Page 135.

"57. Manufacture of Hydrochloric Acid.—This acid is obtained on the large scale as a by-product in the manufacture of soda-ash In the alkali works 10 cwt. of salt is introduced into a large hemispherical iron pan, 9 feet in diameter, heated by a fireplace underneath, and covered by a brickwork dome; upon this mass of salt the requisite quantity (10 cwt.) of sulphuric acid (sp. gr. 1.7) is allowed to run from a leaden cistern placed above the decomposing pan. Torrents of hydrochloric acid gas are evolved, which collect in the space between the pan and the brickwork dome, whence they pass by a brickwork or earthenware flue into upright towers or condensers, built of bricks soaked in tar, or of Yorkshire flags fitted and clamped together. These towers, shown in vertical section in Fig.

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34, and in ground plan in Fig. 35, are filled with bricks or coke, down which a small stream of water from a reservoir at the top of the tower is allowed to trickle. The gas, passing upwards, as shown in the figures by the arrow, meets the water and is dissolved by it; and as the acid-liquor approaches the bottom of the tower it becomes more and more nearly saturated with the gas."

Page 441.

"258. Two processes are now used, viz., (1) measurement of the volumes of the component gases, (2) determination of their weight. The first of these processes, or the eudiometric method, has been practiced by Regnault, Bunsen, Lewy, and Angus Smith, whilst the latter method has chiefly been used by Dumas and Boussingault in their celebrated research carried out in the year 1841. In their analyses of air by the latter method, the two French chemists employed an apparatus shown in Fig. 142. The large balloon (V) was rendered as perfectly vacuous as possible, and brought in connection with the vacuous tube (*a b*), containing metallic copper reduced by means of hydrogen, and placed in a furnace in which it could be heated to redness by means of charcoal or gas. At the other end this tube was connected with the tubes C and B, and with the bulbs A, these last contained caustic potash, and the others
57 pumice-stone moistened with strong sulphuric acid for the purpose of taking up all moisture from the air, as well as of abstracting from it the whole of its ammonia and carbon dioxide. As soon as the tube *a b* had been heated to dull redness the stopcocks *r* were opened so as to let the air pass slowly into the apparatus. Entering the tube *a b*, and coming in contact with the glowing copper, the whole of the oxygen was absorbed, only the nitrogen going over into the vacuous globe."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendants' Exhibit No. 16."

Davy's "Guide to Chemists," Published in London in 1836, Page 23.

The following appears on page 23 of Davy's "Guide to Chemists," published in London in 1836:

"Fill a jar or tube with ammoniacal gas and immerse its mouth in water. The water will absorb the gas rising into the jar and would fill it completely if the gas were pure. Such gases as are absorbed by water cannot be collected over the pneumatic trough, but require the aid of the mercurial trough."

Report of the Sixth Meeting of the British Association in 1836 (Published in London in 1837, Vol. 5, Part 2, Sixth Report, Pages 62-63).

When acetylene gas was first discovered it was called by Edmond Davy, its discoverer, by the name "bicarburet of hydrogen." The

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above-mentioned work contains, at the place stated, an article entitled "Notice of a new Gaseous Bicarburet of Hydrogen," by Edmond Davy, in which article is found the following: "The new Gas—is slowly absorbed by water." "The new Gas is absorbed to a certain extent by, and blackens, sulphuric acid."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendant's Exhibit No. 29."

Storer's "First Outlines of a Dictionary of Solubility," Published in 1864, Page 16.

The following quotation is taken from Storer's "First Outlines of a Dictionary of Solubility," published in 1864, page 16:

58 "It can be said, in general terms, that alcohol is a good solvent for substances which contain much hydrogen, as resins, ethers, essential oils, including those which are oxygenated, etc., and many organic acids."

"Those gases which are abundantly absorbed by water likewise dissolve in considerable quantity in alcohol; and those which are sparingly absorbed by water are also taken up in small quantity only by alcohol; but alcohol generally takes up a greater quantity of a gas, bulk for bulk, than water."

The two paragraphs just quoted from Storer appear, also, in Gmelin's Handbook of Chemistry, Volume 8, page 257, which book was published in London in 1853.

A certified copy of the part from Storer's "First Outlines of a Dictionary of Solubility" to which I have just referred will be filed herewith, marked "Defendant's Exhibit No. 30," and the part from Gmelin's Handbook of Chemistry to which I have just referred will be filed herewith, marked "Defendants' Exhibit No. 31."

Stearns Patent No. 224,240, Dated February 3, 1880.

This patent discloses that long before the application for the patent in suit a method was known of charging carbonate of soda with carbonic-acid gas in a closed chamber by first molding said substance in perforated blocks and then subjecting same to the action of the gas. Inasmuch as the soda responds to the action of the gas and also constitutes a vehicle to receive the gas, it is clear that we have the idea of the absorption of a gas by a solvent, so far as broadly disclosed in the Claude & Hess patent in suit, No. 664,383, answered, since the soda, which is formed in blocks, receives the gas after the manner proposed by the patent in suit.

A certified copy of said Stearns patent will be filed herewith, marked "Defendant's Exhibit No. 17."

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German Patent to Webb No. 58927, Dated 1890, Ausgegeben (i. e., Published) September 21, 1891.

This patent discloses a prepared gas-package comprising a strong metal tank containing highly compressed gas absorbed in a porous substance and provided with a conventional reducing-valve interposed between the tank and the burners, said reducing-valve being for the control of the outflow of the gas from the tank through the burners, and the said gas-package as a whole being intended for the lighting of omnibuses, street cars, railway coaches, and the like.

59 Comparison of this Webb patent with claims 1, 2, and 5 of the Claude & Hess patent in suit will demonstrate that this Webb patent is a complete disclosure of the mechanical construction specified in said claims, and substitution of a solvent charged with acetylene gas for the highly compressed illuminating gas held absorbed in porous material as described in said Webb patent will make complete identity between the disclosure of said Webb patent and claims 1, 2, and 5 of the Claude & Hess patent in suit.

A certified copy of said Webb German patent will be filed herewith, marked "Defendant's Exhibit No. 18."

Dixon Patent No. 567,764, Dated September 15, 1896.

This patent shows a very close approximation to the mechanical structure of the apparatus of the patent in suit, disclosing a gas tank or holder provided in its interior with a pressure-reducing valve for automatically regulating the pressure of the escaping gas, the specification describing the gas as held in the tank under high pressure. The specification states that the gas tank is to be used for lighting railway cars "in which the gas to be utilized is stored under high pressure until required for use," and adds: "In systems of this description it is necessary to reduce the high-pressure gas to a pressure low enough to render it available in the usual burners, for example. This reduction of pressure is usually accomplished by what is known in the art as a 'regulator.'"

A certified copy of said Dixon patent will be filed herewith, marked "Defendant's Exhibit No. 19."

British Patent to Gearing No. 22,183 of 1894.

This patent, like the above-mentioned Dickerson & Suckert patent, No. 582,274 (Defendant's Exhibit No. 8), shows the use of a reducing-valve in an apparatus for dispensing acetylene gas, necessarily under pressure in the generator, the discharge of said acetylene gas under pressure being controlled by a conventional reducing-valve *i*, which is denominated by that name in the specification of said Gearing patent.

A certified copy of said Gearing patent will be filed herewith, marked "Defendant's Exhibit No. 20."

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Saunders & Patton Patent No. 394,018, Dated December 4, 1888.

This patent was cited by the United States Patent Office against the application for the Claude & Hess patent in suit, No. 664,383, and I, therefore, call attention to it. It shows a reducing-valve, which it calls "an automatic pressure-regulator valve C," which is used to control the outlet of gas from a main storage reservoir to control the supply of gas for lighting and heating railway cars.

A certified copy of said Saunders & Patton patent will be filed herewith, marked "Defendant's Exhibit No. 21."

British Patent to Abel No. 9901, Dated July 14, 1887.

This patent discloses the use of a reducing-valve for controlling the flow of gas from a reservoir for lighting railway cars, and was cited by the United States Patent Office against the application for the Claude & Hess patent in suit, No. 664,383.

A certified copy of said Abel patent will be filed herewith, marked "Defendant's Exhibit No. 22."

Schülke Patent No. 577,989, Dated March 2, 1897.

This patent was cited by the United States Patent Office against the application for the Claude & Hess patent in suit, No. 664,383, and I, therefore, refer to the same. It discloses the use of an automatic pressure-regulating apparatus for controlling the flow of heavy hydrocarbons under high pressure from a chamber in a lamp at a suitably reduced pressure to the burner.

A certified copy of said Schulke patent will be filed herewith, marked "Defendant's Exhibit No. 23."

Hill Patent No. 261,607, Dated July 25, 1882.

This patent discloses the use of a reducing-valve "to govern varying pressures," so as to deliver compressed air at a uniform pressure notwithstanding that the pressure of same may vary in the reservoir.

A copy of said Hill patent will be filed herewith, marked "Defendant's Exhibit No. 24."

The Milwaukee Case.

I have hereinabove stated that the presentation of the prior art relevant to the Claude & Hess patent in suit, No. 664,383, in the case of Commercial Acetylene Company v. Avery Portable Lighting Company at Milwaukee was very inadequate; and it was only because of the incomplete and defective exhibition of the prior art to

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the court in that case by the defendant that it was possible for Judge Quarles, who decided that case, to make the following incorrect statements:

"There is one feature of the Claude & Hess discovery which is of paramount importance, namely, the peculiar affinity of
61 acetone for acetylene, and especially the modifying influence of each upon the other when combined in a supersaturated solution. Acetone is volatile and inflammable, and its vapor when mixed with air is explosive. Acetylene is highly explosive. Defendant suggests no law of physics, or treatise, *or source of information* that would have led to the discovery that both elements would become harmless when so combined. Claude & Hess were the first to make known these peculiar and wonderful properties, which they must have discovered by actual experiment. This fact is attested by the literature of the art and by the testimony here adduced. * * * In concluding the discussion on the question of patentability, we may state concisely what Claude & Hess have accomplished by their discovery. First. By equipping the gas package with acetone as a solvent, they have enormously increased the storing capacity of the tank, rendering it possible to store under moderate pressure 300 times as much acetylene gas as could otherwise be compressed therein. Second. They have disclosed the chemical changes that take place in both gas and liquid when so combined, which render both innocuous and capable of safe transportation" (italics mine).

It was manifestly because of the erroneous views held by Judge Quarles, as expressed in the foregoing quotation, that he sustained as valid claims 1, 2, and 5 of the patent in suit and violated the language of those claims in holding a needle valve, which is a manually-operated, non-automatic means for controlling the out-flow of the gas, to be the equivalent for means for controlling the exit of gas "at substantially uniform pressure." Of course, Judge Quarles was not responsible for the record in that case, and his decision was based solely upon the record that defendant placed before him. Judge Quarles is not to be blamed for imagining from the grossly inadequate and incomplete record of the prior art placed before him by defendant in the Milwaukee case that "There is one feature of the Claude & Hess discovery which is of paramount importance, namely, the peculiar affinity of acetone for acetylene," and the diminution of the explosive character of the former when held in solution in the latter; but the record in the present case shows that the premises for his conclusion was unfounded, and that the fact is the contrary of what Judge Quarles on the inadequate record before him imagined it to be as to the credit due Claude & Hess in connection with the use of acetone as a solvent for acetylene gas. If the Suckert evidence presented in this case or the Dickerson patent No. 662,258 had been before Judge Quarles his decision would have been necessarily different as to claim 5 (which is the
62 only one of the claims that specifically mentions acetone), while if nothing more than the above-quoted extract from the 1866 Annales de Chimie et de Physique, which mentions alcohol

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as a solvent which will absorb without pressure six times its own volume of acetylene gas, had been before Judge Quarles his decision would have been necessarily different as to claims 1 and 2, which, because of their use of the term "solvent," read as well upon alcohol as upon acetone (the only two solvents mentioned in the specification of the patent in suit, line 77, page 1).

None of this important information about the prior art was, however, before Judge Quarles, either as to alcohol or acetone, while defendant in the case at bar uses the new solvent "Terpeline."

Strange to say, no prior patents or publications were offered in evidence in the Milwaukee case to anticipate or tend to anticipate the Claude & Hess patent, and the only ones that were offered in evidence were offered relative to the Fouché patent, No. 727,609, that was joined with said Claude & Hess patent in the Milwaukee suit. Regarding said Fouché patent, Judge Quarles, in his opinion, says (166 Fed., at page 908):

"Upon the final hearing complainant withdrew its contention as to the Fouché patent, so that the issues in the case are limited to the Claude & Hess patent." Yet no prior art had been offered in evidence in the record to affect said Claude & Hess patent. The only prior art offered in evidence by the defendant in the Milwaukee case was as follows: James patent, No. 240,423; Holloway & Stineman, No. 190,037; Lindsley, No. 130,924; a French publication entitled "Competes Rendus;" and the French patent to Claude & Hess, No. 257,679—all of which were offered only in connection with the Fouché patent. No prior art to assail the validity of the Claude & Hess patent was offered in evidence at all in the Milwaukee case. Not even the prior patents cited by the Patent Office against the application for the Claude & Hess patent in suit were offered in evidence in the Milwaukee case, although they were set up in the answer in that case and would have had a most important bearing upon the validity and scope of the Claude & Hess patent if Judge Quarles had known about them. The mere fact that these patents and some publications were set up in the answer in the Milwaukee case did not put them before the court. It was necessary that they should be offered in evidence as exhibits and explained by the testimony of defendants' expert, in order that the court might know their contents, which contents was most pertinent and would have radically changed the nature of the opinion rendered by
63 Judge Quarles. So far from being commented on in the testimony of defendants' expert, the record in the Milwaukee case shows that they were not even offered as exhibits. The same is true of the "Journal of the Franklin Institute" mentioned in the answer in the Milwaukee case, and the same is likewise true of page 791, Volume II, of the 1875 edition of Watts's Dictionary of Chemistry and of the "Treatise on Beverages," by Sulz, published in 1888, pages 119 and 123, and other publications mentioned in defendant's answer in the Milwaukee case, the record in that case containing no offer of same as exhibits. They, consequently, were not before the court, and the decision of Judge Quarles in the Milwaukee case was rendered without knowledge of the nature of the anticipa-

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tions of the Claude & Hess patent that were pleaded in defendant's answer.

The Stearns patent, No. 224,240, of 1880, was not before the court in the Milwaukee case, and was not even referred to in the answer therein.

Expiration of British Patent No. 29750 of June 30, 1896, to Claude & Hess and Effect thereof on Term of Patent in Suit.

If the patent in suit is construed as broadly as Judge Quarles construed it, it is for precisely the same invention as that patented by British patent No. 29,750, dated June 30, 1896, granted to the same patentees, and, under Section 4887 R. S. U. S., the patent in suit, therefore, expired June 30, 1910.

Necessarily this is a defense that was not available in the Milwaukee case, which was decided long before June 30, 1910, when the term for which British patent No. 29,750 of 1896 was granted expired. British patents such as No. 29,750 of 1896, are granted for a term to expire fourteen years from their dates, which of this Claude & Hess British patent No. 29,750 is June 30, 1896, making the expiration of its term on June 30, 1910.

To prevent the operation of Section 4887 R. S. U. S. and the expiration of said British patent on June 30, 1910, to terminate the life of the United States patent in suit, it is likely to be argued that the claims of the United States patent No. 664,383 are limited to a reducing valve. If so limited, defendants' gas-package does not infringe; if not so limited, the patent in suit has expired.

64 That, as a matter of fact, said British patent is for the same alleged invention as that of the patent in suit, and, therefore, that the patent in suit has expired, will appear from the following extract from the specification of said British patent and claim 6 thereof:

"This invention relates to an improved method of storing acetylene, for lighting and other purposes, in a small volume in order that it may be supplied in portable form to the consumer, and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene and so enable a considerable quantity of acetylene to be stored in a small volume in readiness to be supplied for any purpose for which it may be required. * * * For these reasons we avail ourselves of the great solubility of acetylene in certain liquids, and increase this solubility by pressure, and this method of storing acetylene gas is the invention which we hereby broadly claim as our invention, whatever may be the liquid employed, the kind of apparatus used, or mode of operation. * * * With a pressure about equal to that used in a soda-water syphon, we are able to store a considerable volume of acetylene in a receiver of relatively small dimensions. With a liquid dissolving m times its volume of acetylene, we can thus store at equal pressure about m times more gas than if it were simply compressed without being dissolved in a liquid, which is the principle of our invention. When gas is withdrawn from a receiver

containing a solution of acetylene under pressure, the pressure necessarily falls constantly, *and to obtain a regular supply of gas we provide the vessel with a pressure regulator.* The process may be carried out as follows, for instance, although subject to modifications. The acetylene is dissolved in the liquid chosen, for instance by the means ordinarily employed in making sodawater, the solution of the gas being facilitated by agitation under pressure in contact with the liquid. The solution under pressure, however obtained, is filled into a receiver of metal or of glass (such as used for soda-water) capable of resisting the pressure employed. The receiver has a cock and the necessary adjuncts for connection, directly *or through an expansion,* with the appliances in which the gas is used by the consumer, this substitution of charged for empty receivers being readily effected" (italics mine). * * * 6. "The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified."

The way British patents are interpreted by the British courts, there is no doubt that the "pressure regulator" mentioned in the part of the specification of the British patent quoted above would be held, in connection with the word "evolved" in said claim 6 and the words "as specified" found in said claim 6, to be implied in said claim as an element thereof, so as to make claim 6 of said British patent identical with claims 1, 2, and 5 of the Claude & Hess patent in suit, No. 664,383. This is especially true of these claims as they were construed by Judge Quarles in the Milwaukee case.

The substance of the alleged invention described and claimed in the British patent No. 29,750 dated June 30, 1896, and in United States patent No. 664,383 is precisely the same. The fact that the title of said British patent is "Method of Storing Acetylene" while that of the patent in suit is "Apparatus for Storing" is immaterial, as the subject-matter contemplated and patented by each is the same. The "pressure regulator" mentioned in said British patent is the same device as that called a "reducing-valve" in the patent in suit and mentioned in claim 1 of the patent in suit as means for controlling the gas-outlet whereby the gas may escape therethrough at substantially uniform pressure.

Defendant's Exhibit No. 25 filed herewith is a certified copy (certified by the British Comptroller-General of Patents, Designs, and Trade-marks) of said British patent No. 29,750 dated June 30, 1896, and the certificate attached thereto shows that under the provisions of section 103 of the Patents, Designs, and Trade-Marks Act, 1883, the date of 30th June, 1896, was claimed for the said application, being the date of an application for a patent in France for the same invention, and that said British patent No. 29,750 was granted as of June 30, 1896, which under the British law, as hereinabove stated, would cause the term for which same was granted to expire on June 30, 1910, said certificate, furthermore, showing that through failure to pay the taxes on said British patent due June 30, 1900, said British patent No. 29,750 of 1896 lapsed on June 30, 1900,

which was about six months before the patent in suit, United States patent No. 664,383, issued, the date of grant for the patent in suit being December 25, 1900.

Defendant's Exhibit No. 26 is a certified copy of said French patent to Claude & Hess, dated June 30, 1896, No. 257,679, the date of the application for which was claimed as the date of priority for said British patent No. 29,750 of June 30, 1896, and includes a certified copy, also, of the certificate of addition dated March 20, 1897, to said French patent No. 257,679 and of the certificate of addition dated October 15, 1897, to said French patent No.
66 257,679 and translations of said original French patent No. 257,679 and of said two certificates of addition.

Defendant's Exhibit No. 27 reads as follows:

"Patents and Designs Act, 1907.

"It is hereby certified by Henry Hatfield, acting for the Comptroller-General of Patents, Designs, and Trade-Marks, that in pursuance of the application of Georges Claude and Albert Hess No. 29750 of 1896, a Patent was granted on the 15th of March, 1898, and sealed as of the 30th June, 1896, under the provisions of section 103 of the Patents, Designs and Trade-Marks Act, 1883; that the said Patent was granted for the term of fourteen years from the 30th June, 1896, provided the payments prescribed by Section 17, sub-section 2 of the said Act were duly made; and that the Patent in question expired on the 30th June, 1900, through failure to pay the prescribed renewal fee which became due on that date.

"Witness my hand this 7th day of March, 1911.

[Seal of the British Patent Office.]

"H. HATFIELD,
Acting for the Comptroller-General of Patents, Designs, and Trade-Marks."

"Consulate-General of the United States of America for Great Britain and Ireland, at London.

"I, Richard Westacott, Vice and Deputy Consul-General of the United States of America for Great Britain and Ireland at London, do hereby make known and certify to all whom it may concern, that the signature 'H. Hatfield,' subscribed to the annexed Certificate, is of the true and proper handwriting of H. Hatfield, acting for the Comptroller-General of Patents, Designs and Trade-Marks, London, England; that the seal affixed to the said Certificate is the seal of the Patent Office, London; and that to all acts signed as the annexed full faith and credit are and ought to be given in Judicature and thereout.

"In testimony whereof I have hereunto set my hand and affixed the Seal of the Consulate-General of the United States at London, aforesaid, this 10′ day of March, 1911.

[Seal of the U. S. Consulate-General.]

"RICHARD WESTACOTT,
"Vice and Deputy Consul-General."

67 German Patent No. 97,953, Granted to Claude & Hess August 27, 1896.

The term of German patents is for fifteen years from their date, and, therefore, this patent will expire August 27, 1911. Defendant's Exhibit No. 28 is a certified copy of this German patent, and the certificate attached thereto shows that same will expire on August 27, 1911. Defendant's Exhibit No. 33 is a translation of Defendant's Exhibit No. 28. Absolute identity exists between the alleged invention described and claimed in this German patent to Claude & Hess and that described and claimed in the United States patent in suit, No. 664,383. Even the "pressure-regulator" or "reducing-valve" of the patent in suit is mentioned in the claim of this German patent, and the substance of claims 1, 2, and 5 of the patent in suit is precisely and identically found in the claim of this German patent. This will be shown by the following quotation from the specification of said German patent and by the claim of said German patent:

"In the processes customary heretofore for storing and utilizing acetylene the gas was either only compressed or liquefied; in the former case the volume can be diminished only approximately proportionally to the pressure employed, whilst in the latter case it is true the volume is reduced to the smallest amount, but the requisite pressure is exceedingly great and materially varies with the temperature of the gas. According to the present process, a relatively considerable diminution in volume can be obtained by simple compression without having to employ such high pressures as are requisite for liquefying the gas. Acetylene is absorbed by certain liquids, to wit, the more the higher the pressure is to which the acetylene and the liquid are subjected. Therefore, according to the present process the gas is brought under pressure into intimate contact with liquids suitable for its absorption (with the aid of excess pressure, movement, cooling, etc.) in order that as large a quantity as possible may be absorbed by the liquid. The liquid saturated with acetylene is then put into vessels sufficiently capable of resisting the pressure. For absorbing acetylene the following are specially suitable: the various alcohols, particularly methyl alcohol, ethyl alcohol, amyl alcohol, also benzine, toluene, zylene, acetic acid, acetone, petroleum, chloroform, etc. The pressure employed may be as desired; preferably it amounts to upwards of 5 to 20 atmospheres. Before
68 the absorption the acetylene is caused to pass through suitable liquids or over suitable materials in order to liberate it from its impurities. The vessels for holding the liquid saturated with acetylene must be provided with a cock or valve from which the gas escapes according to the diminution of pressure which occurs and can then be used for the customary purposes. * * * As the pressure of the gas diminishes whilst escaping from the absorbent liquid, when a constant pressure is required a pressure-reducer or pressure-regulator of any desired construction is interpolated. Consequently, as means for storing acetylene in large quantities in a small volume the great power of absorption of certain liquids is

used, a power which considerably increases with the pressure. The employment of light portable receptacles is thereby enabled which are filled with liquid and can be employed again. As the weight of the receptacle is relatively small, with ordinary sizes more acetylene can be stored per unit of the total weight than is allowed by the ordinary methods, such as simple increase of pressure or liquefaction. As an example of this a receptacle of 1 litre content may be taken. When acetylene is raised in such a receptacle to a pressure of 12 atmospheres, the litre absorbs about 12 litres of this gas. Now if this receptacle is filled with a suitable liquid, e. g., acetone, whose power of absorption is very great and its price low, approximately 25 litres gas will be stored in this vessel at a pressure of only 1 atmosphere. Now if the pressure is increased to 12 atmospheres, as in the above example, about 300 litres acetylene are stored in this receptacle containing only 1 litre acetone. Consequently, one has 25 times more than in the case when the receptacle contained no liquid and could contain only 12 litre- acetylene at a pressure of 12 atmospheres. Now compare the results obtained in this example. In the former case (when illuminating purposes were in view) one 15 candle-power burner can be fed for approximately 1 hour, whilst in the case when the receptacle is filled with acetone the same light is obtained during 25 hours. The commercial advantage thus obtained is indisputable and the result entirely new. Besides this advantage, however, others not less great can be advanced. The described means is the sole one which enables such large quantities of acetylene to be stored in such a small volume and at such a low pressure. It follows that the receptacles require to be less strong than those for liquid acetylene, and the following comparative results have been arrived at after detailed tests: * * * Another commercially new result is based on the fact that the dissolving of the acetylene in liquids considerably diminishes its capability of explosion. The temperature of decomposition of the mass is much less and this circumstance renders the industrial utilization of
69 acetylene less dangerous. The absorption of the acetylene may be brought about by any process known in the industry for similar conditions, e. g., by a process corresponding to the manufacture of artificial soda-water. As an example, an apparatus is hereinafter described with whose aid the storing process can be carried into practice. It may, however, be mentioned that the process is in no way limited to the apparatus described and shown. * * * In case it is necessary to withdraw the gas at constant pressure from the flask, as already mentioned a pressure regulator is interpolated, namely, the acetylene may be simply conducted into a gasometer or one of the many known pressure reducers is arranged directly over the gas outlet. Indeed, the apparatus described above and shown in Figs. 1 and 2 are only given by way of example for explaining the process and the latter is independent of the described constructional forms.

"Patent Claim.

"The employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating, and the like, characterized by the acetylene being absorbed under pressure by a suitable liquid and the liquid saturated with acetylene being preserved or contained in suitable vessels, from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed."

The "pressure regulator" mentioned in the claim of this German patent in the same device called a "reducing-valve" in the claims and specification of the patent in suit, No. 664,383, and referred to in claim 1 of the patent in suit as means for controlling the gas-outlet "whereby the gas may escape therethrough at substantially uniform pressure." If any one were to have any doubt as to the identity between the alleged invention which is the subject-matter of British patent No. 29,750 dated June 30, 1896, and that of the patent in suit, even such person could not entertain any doubt as to the clear and absolute identity between the alleged invention the subject-matter of the patent in suit and the subject-matter of said German patent No. 97,953, dated August 27, 1896.

The Apparatus of the Patent in Suit Inoperative and Dangerous.

The specification of the Claude & Hess patent in suit, No. 664,383, says that it is one of the essentials of the alleged invention of that patent that the outlet for the gas shall be so positioned as to be normally above the level of the solvent containing acetylene gas in solution. Hereinabove I have explained at length that both of the solvents, "alcohol or acetone," mentioned in the specification of the patent in suit are so volatile and non-viscous that they will "blow" in detrimental amounts if the outlet for the gas be not located at a point above the level of the solvent. This aspect of the alleged Claude & Hess apparatus is not only emphasized in the specification of the patent in suit (lines 26-31, page 1) and claims 2, 3, 4, 5, and 6 specifically limited thereto, but it pervades that patent, as shown by the drawings and specification and claims as a whole. According to the drawings and specification, the partition d^3 separates the receptacle or vessel a into two chambers, the lower one containing the solvent b and the acetylene gas held in solution therein under pressure, and the upper chamber in which the acetylene gas is stored after having escaped from the solvent. Since the use of a solvent to hold the gas is for the purpose of diminishing its explosibility, it is obvious that the freed gas contained in the upper separate chamber of the tank or receptacle a of the patent in suit must be in a dangerous state and is as liable to explosion as any acetylene gas is that has never been dissolved in a liquid. A glance at Figure 1 of the patent in suit will show that while the acetylene gas contained in solution in the solvent b may be safe enough from the danger of explosion, yet that no such safeguard from explosion is provided for the gas in the part of said tank or

receptacle above the partition or diaphragm d^3. On inspection, therefore, it is evident that the apparatus of the Claude & Hess patent in suit is inoperative for the purpose contemplated, and that the explanations of greater safety because of the use of the solvent in the lower chamber of the tank *a* simultaneously exhibit the retention of danger of explosion in connection with the contents of the upper chamber of tank *a*. This is doubtless why in practice the tanks marked "Prest-O-Lite," such as depicted in the drawing marked "Defendant's Exhibit No. 1," all contain a porous substance, such as shown and described in the Fouché patent No. 727,609, a certified copy of which is filed herewith marked "Defendant's Exhibit No. 34." The specification of said Fouché patent says (lines 23-28, 38-43, page 1): "The receptacle A is filled with a porous substance C. Many different substances may be used, such as asbestos, mineral wool, carbon, pumice-stone, and ceramic materials. One substance which I find very advantageous for this use is porous brick * * * In preparing my receptacle for
71 the storage of the gas in compressed form I saturate the porous substance with some solvent of the gas—as, for instance, in storing acetylene gas I would saturate the porous substance with acetone."

From this it appears that the commercial success of the "Prest-O-Lite" tanks (which are not made in accordance with the Claude & Hess patent in suit, as above pointed out) has been due to the utilization of the porous filler described, illustrated, and claimed in said Fouché patent No. 727,609.

Reducing-valves.

In view of certain misleading expressions or statements in the affidavits on behalf of complainant in the Chicago case, it is proper to say that it is incorrect to call a valve a reducing-valve merely because the pressure of the gas remaining in the tank is less after part of it has been allowed to escape through any kind of an opening or valve than before. Broadly considered, a valve is anything that closes an opening in such man-er as to control the flow of a liquid, vapor, or gas, or loose material in bulk, through a pipe, passageway, outlet, or inlet in any form of containing-vessel (Century Dictionary). If any kind of a valve be applied to the mouth of a tank or other receptable containing compressed gas, and such valve be opened from time to time, so that some of the gas in the tank or receptacle is allowed to escape therefrom, the pressure of the gas that is left in the tank will be less, and, in that sense, will be reduced, because, of course, less pressure is reduced pressure. It can not be regarded as the correct use of the term "reducing-valve", however, to call any and every valve that lets gas out of a tank a "reducing-valve" simply because the escape of part of the gas necessarily diminishes the pressure of the remainder of the gas. Not every vehicle is an automobile, and similarly not every valve is a reducing-valve. If every valve can be called a "reducing-valve" merely because the law of nature is that when part of a body of com-

COPY BOUND CLO

pressed gas has escaped from a vessel the remainder abides under diminished pressure, then the term "reducing-valve" is emasculated of all meaning. On this theory, every valve is a reducing-valve. A mere cork stopper used to close the mouth of a bottle containing compressed gas will, under such misuse of terms, be a reducing-valve, because each time said bottle stopper is removed or partly removed, so as to allow some of the compressed gas to escape from the bottle, the pressure of the remainder of the gas is diminished or reduced. This shows the absurdity of claiming that a needle valve or any other mere stop valve is a reducing-valve. If every
72 valve is a reducing-valve, there is no sense or meaning to the term "reducing-valve". The simple word or term "valve" will answer all purposes, as it is well known that the pressure of confined compressed gas will diminish or be reduced by allowing some of it to escape. This can be illustrated by a child's toy balloon, from which gas gradually escapes through the opening uncontrolled by any valve, the rubber end being merely tied as tightly as may be by means of thread. If complainants' affidavits are correct, this opening devoid of any valve is itself a reducing-valve, because thereby the pressure of the gas remaining in the balloon is reduced. The fact is, as stated in the forepart of this affidavit, that the term "reducing-valve" is only a technical term that means an automatic device, whereby the decrease of the gas or the like on one side of the reducing-valve will cause its automatic replenishment through the reducing-valve by reason of the diminished pressure upon that side, because of the decrease of the supply of gas on that side. This use of the term is ratified not only by the Century, Webster's, and other dictionaries, but is the uniform and universal sense in which that term is used in the specifications of patents and in mechanical descriptions generally, and it is never used in any other sense. It is impossible, therefore, that a needle valve or any other non-automatic valve shall or can be the mechanical equivalent for a reducing-valve, because it lacks the essential functional characteristic of a reducing-valve, namely, its automatic control of the flow of the gas or other liquid which it regulates, due to the automatic replenishment on the outer side of the valve of the store of gas on that side. As pointed out above, it is immaterial what meaning may be attached by others to the term "reducing-valve", because the specification of the Claude & Hess patent in suit, No. 664,383, itself precisely and accurately defines in just what sense the term "reducing-valve" is used in the patent in suit, inasmuch as the specification of the patent in suit explicitly states (lines 95-97, page 1) that the pressure in the receiver *a* will decrease as it becomes emptied of gas, and to obviate this and in order to obtain the desideratum set forth in the specification of the Claude & Hess patent that the pressure at the burners shall be "substantially the same when the receptacle is fully charged as when it is nearly exhausted" (page 2, lines 17-19), the patentees provided the reducing-valve *d*, the specification furthermore saying (page 2, lines 13-20): *"It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes*

is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

73 The language of the specification of the Claude & Hess patent in suit just quoted defines not only the meaning of the term "reducing-valve", but, also, the meaning intended by said patent to be attached to the phrase in claim 1 referring to the gas outlet and reading "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure".

The escape of the gas from the "Prest-O-Lite" tank shown in Defendant's Exhibit No. 1 and from defendant's tank shown in Defendant's Exhibit No. 2 is not and can not be "substantially the same when the receptacle is fully charged as when it is nearly exhausted", but in the case of both tanks is subject to the law, recognized and stated by Claude & Hess in the specification of their patent in suit (page 1, lines 95-97), that the pressure of the gas within the receiver or tank will decrease as the gas passes out therefrom. The pressure of gas in the tanks depicted in Defendant's Exhibits Nos. 1 and 2 naturally and necessarily gradually decreases, and it is common knowledge of users of such tanks that when the valve in a fully charged tank of this kind is opened for the first time the gas rushes out with a mighty force and a loud noise and that when some of the gas has been used out of said tank the force and noise of the gas escaping are much less and that the valve must be opened by hand much wider, in order to obtain an adequate flow, than when the tank is full and that eventually when the tank is nearly empty the valve must be opened by hand very wide, in order to secure any supply of gas at all at the burners, and that its escape makes then practically no noise and that its force is extremely feeble. This is entirely unlike the "substantially uniform pressure" of claim 1 of the patent in suit, secured as the patentees contemplated and the specification states (page 2, line 14) "through the agency of the reducing valve," which pressure is prescribed by the specification of the patent in suit (page 2, lines 18-20) to be such that it is "substantially the same when the receptacle is fully charged as when it is nearly exhausted".

Second Suckert Affidavit.

Respecting the Second Suckert Affidavit, referred to on pages 40 and 41 [printed pages 31 and 32] of this affidavit; upon writing his office, 30 Church Street, New York City, to request him to execute the same, I am advised that he is in Europe, and therefore, inaccessible at present. The circumstances surrounding the

74 obtaining of this affidavit are as follows: Upon ascertaining the whereabouts of Dr. Suckert I arranged an appointment with him at his office in New York, which was kept, and at which he advised me fully as to his experiments and tests with acetylene gas, said interview being had some time during the month of December, 1910. As the result of said interview I prepared and sent him a draft of an affidavit for his approval, which he revised and

Fig. 1.

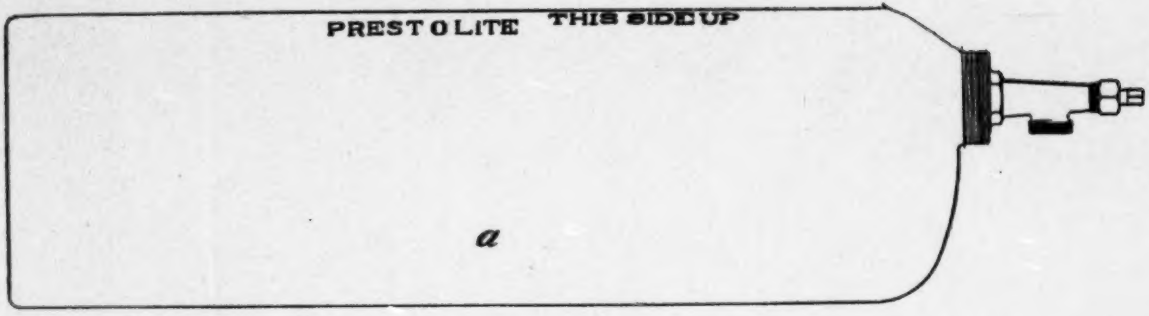


Fig. 2.

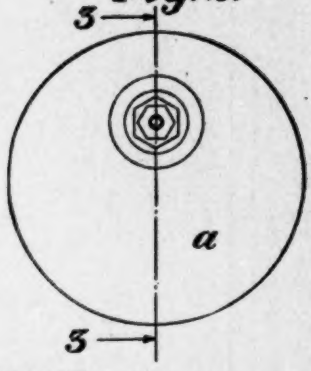
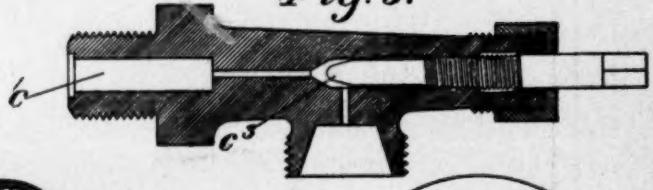
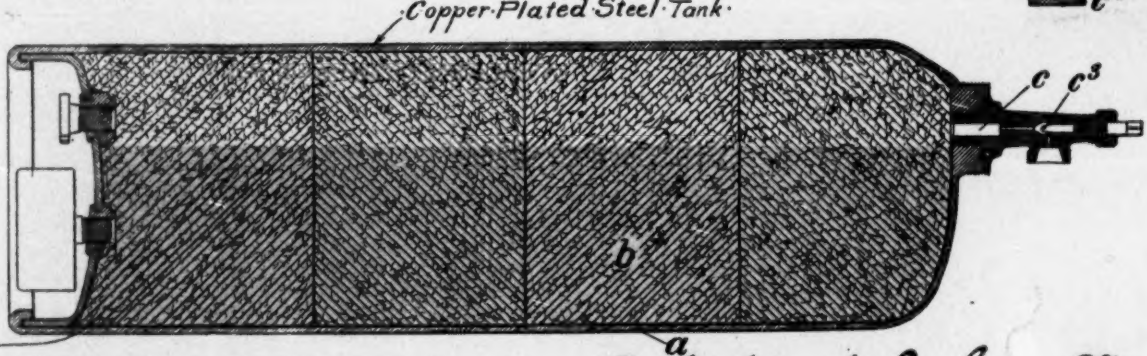


Fig. 5.





yellow denotes the location
the solvent — "alcohol or acetone".

Fig. 3.

Fig. 4.

Defendant's Exhit No. 1.

75

Fig. 1.

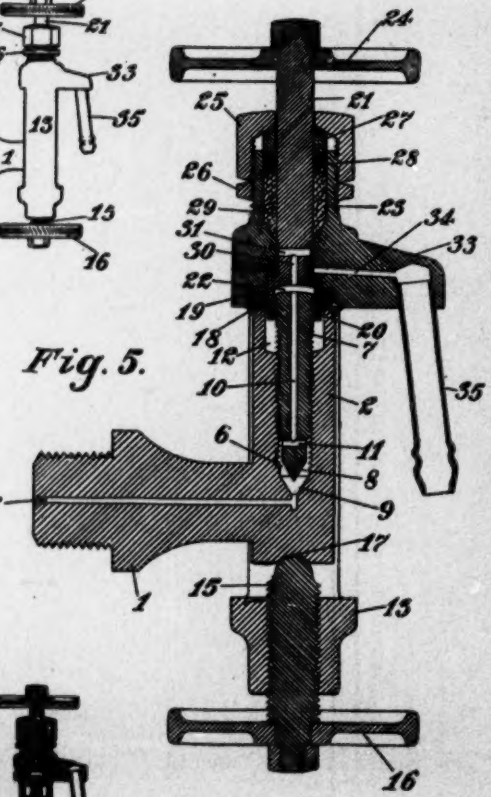


Fig. 5.

Fig. 4.

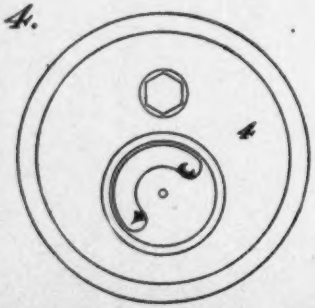
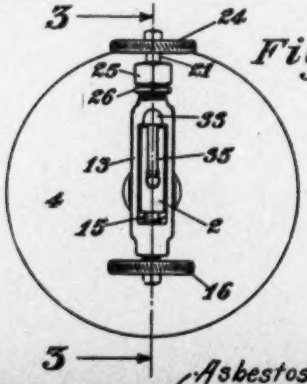
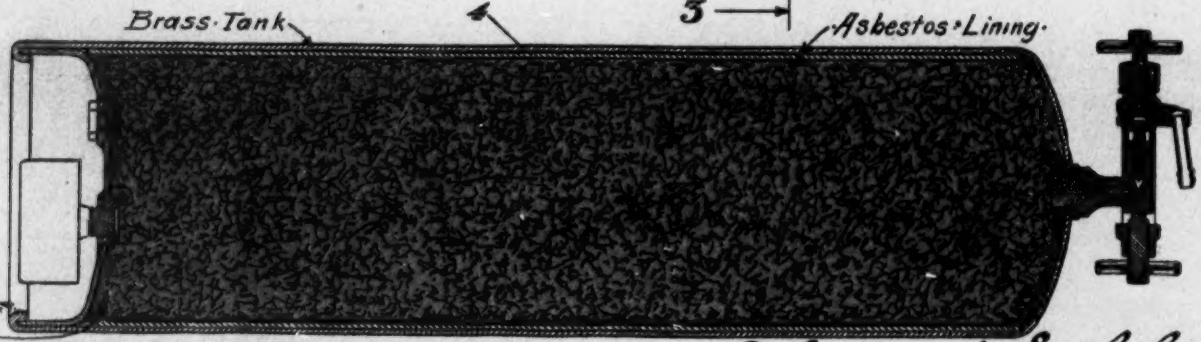


Fig. 2.





red denotes the location
solvent – "Terpeline".

Fig. 3.

Defendant's Exhibit No. 2.

returned, and accompanied the same by an ink sketch or drawing illustrating the apparatus used by him in his tests. The original of this affidavit, together with said original drawing, were sent some time last spring to the New York office of the said Suckert for him to execute, but I was then advised that he was in Europe, and that all that could be done was to forward the affidavit in an effort to reach him. A letter addressed to his New York office, and mailed August 19, 1911, has not been answered.

Attached to this affidavit and marked "Defendant's Exhibit, Copy of Second Suckert Affidavit," is a true copy of the original affidavit prepared by the said Suckert, and sent to him for execution. Also attached to this affidavit, and marked "Defendant's Exhibit, Print of Drawing in Second Suckert Affidavit" is a blue print taken from the original drawing sent me by the said Suckert and referred to in "Defendant's Exhibit, Copy of Second Suckert Affidavit," said original drawing having been sent, together with said original affidavit, to the New York office of the said Suckert, as hereinbefore stated, from whence it has not been returned.

PERCY B. HILLS.

Sworn to and subscribed before me this 26th day of August, 1911.

[SEAL.] CHARLES LOWELL HOWARD,
Notary Public.

(Here follow drawings marked pages 75 and 76.)

77 DEFENDANTS' EXHIBIT COPY OF SECOND SUCKERT AFFIDAVIT.

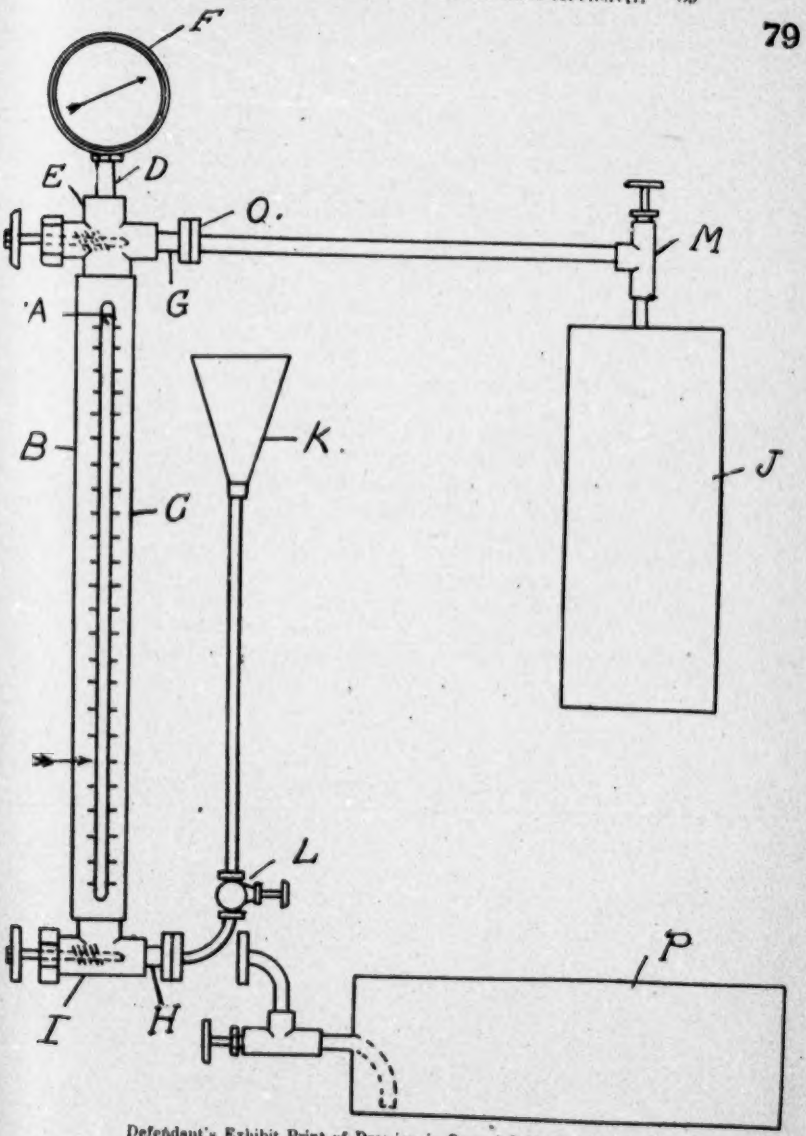
In the United States Circuit Court, Eastern District of Missouri, Eastern Division.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY et al., Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY, Defendant.

CITY OF NEW YORK,
State of New York, ss:

Julius J. Suckert, being duly sworn, deposes and says as follows: I am the Julius J. Suckert who executed an affidavit dated January 21, 1898, and filed in an application for letters-patent by Edward N. Dickerson, April 8, 1897, Serial No. 631,319, on which application letters-patent No. 662,258, were issued November 20, 1900. I am by profession a consulting chemist, and am a graduate of the University of Freiburg, Germany, where I received the degree of Ph. D. I have been interested in the liquefied gas industry since 1881; have taken out a series of U. S. patents appertaining to the liquefaction of gases in the years 1884 and 1885; during and since the year 1895, jointly with the said Edward N. Dickerson, I took out certain U. S. patents pertaining to the production and commercial utilization of liquefied acetylene, including U. S. patent No. 582,274, the application for which was filed in the United States Patent Office, March 4, 1896; and since the inception of the acetylene industry to date I have been actively connected with said industry. In the year 1895, at the request and suggestion of the said Edward N. Dickerson, with whom I was then engaged in making extensive experiments and tests on calcium carbide and acetylene gas, and on apparatus in connection therewith, I conducted a series of tests for the purpose, among others, of ascertaining the solubility of liquefied acetylene gas in various solvents thereof, among which were alcohol, methyl alcohol, amyl alcohol or fusel oil, benzine, chloroform and acetone. Said tests were made at the works of the National Ice Machine Company, 6 and 8 Water Street, Brooklyn, N. Y., in either April or May, 1895, shortly after I had read a paper on calcium carbide and acetylene gas before the Franklin In-
78 stitute, Philadelphia, Pa., which paper was read March 20, 1895. A very complete record was made of said tests, which was subsequently with others kept in the Experimental Laboratory of the United States Acetylene Distributing Co., 530-536 Montgomery St., Jersey City, N. J., where said records and said works were destroyed by fire on December 23, 1897. I have prepared and attach hereto a sketch illustrating the apparatus used by me in said tests, wherein the letter A indicates an inner chamber of glass, sur



Defendant's Exhibit Print of Drawing in Second Suckert Affidavit.

rounded by a metallic casing B, graduated slots C being formed in said casing B in order that the contents of chamber A might be seen and measured. Mounted on pipe D projecting from the valve E at the top of the device is a pressure gage F, and a pipe G leads from the valve E for connecting to tank J containing acetylene gas under pressure, or for discharging the gas when desired by opening flanges O. A pipe H leads from valve I at the bottom of the device.

In operation, a receptacle K for receiving the solvent to be tested was attached to pipe H, as shown, and the air displaced in the chamber A, connecting pipe H and receptacle K with acetylene gas by opening the valves I, E, L and M, attached respectively to the chamber A, receptacle K and the tank J. The valves I, E and M were then closed and the solvent to be tested poured into receptacle K whence it was allowed to flow into chamber A to any desired point, say to the arrow, by opening the valve I. If the solvent under test did not flow freely into chamber A, its entrance was facilitated by slightly opening flanges O and stop cock E until the desired amount had entered chamber A, when they were both closed. The desired quantity of solvent having been admitted to chamber A the valve I was closed, and the receptacle K, after closing valve L, was detached, and the tank P containing liquefied acetylene gas attached to pipe H. The liquefied gas was then allowed to pass slowly into chamber A through the solvent therein, and was absorbed up to the capacity of the solvent at the existing pressure.

Duirng these tests at that time with acetone as the solvent I observed that acetone had the capacity for absorbing many times its volume of acetylene, and formed when under pressure a supersaturated solution, the explosive character of the acetylene gas being neutralized by its being held in solution by the acetone.

Subscribed and sworn to before me this — day of ——, 1911.

—— ——.

(Here follows drawing marked page 79.)

80 In the Circuit Court of the United States in and for the Eastern Division of the Eastern District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
vs.
FIREBALL GAS TANK AND ILLUMINATING COMPANY et al., Defendants.

STATE OF MISSOURI,
City of St. Louis, ss:

William B. Potter, being duly sworn, on his oath deposes and says, as follows:

I am sixty-five years of age; a resident of St. Louis, Missouri, and a consulting Mining Engineer, Metallurgist and Chemist. I was educated at Columbia University, New York, N. Y., taking the full classical course in the college department, graduating with the degree of Bachelor of Arts, and afterwards taking the full Mining and Metallurgical course in the School of Mines, receiving the degree of Engineer of Mines. I have also received from Columbia University the degrees of Master of Arts and Doctor of Science. I was for twenty-three years professor and head of the Department of Mining and Metallurgy at Washington University, St. Louis, Missouri, and for forty years or more I have been actively engaged in professional work in the line of mining, metallurgy, and applied chemistry. For more than twenty-five years I have been proprietor and manager of the St. Louis Sampling & Testing Works, an establishment equipped with chemical and technical laboratories, where I have conducted large numbers of chemical investigations and engineering tests relating to mining and metallurgical operations as well as to a great variety of manufacturing and commercial industries, and concerning the composition of matters, processes, apparatus, and mechanical appliances. For more than thirty-five years I have given attention to, and conducted investigations, as to the scope, validity, and infringement of, a great many patents for inventions relating to the various arts, and have testified before the courts as expert in many suits relating to United States letters-patent.

81 I have read and understand the United States letters-patent to Claude and Hess, No. 664,383, dated December 25, 1900, also the files of the Patent Office relating to the application for the said Claude and Hess patent No. 664,383, also the files of the Patent Office giving all the proceedings in the Patent Office relating to the application of the said Claude and Hess for "Method of Storing Acetylene Gas for Distribution" Serial No. 625,581. I have in addition read and I understand the various patents and publications cited by the Patent Office against said applications. Numerous other patents and publications relating to this subject have also been carefully read and are thoroughly understood by me.

The Patent Suit.

The Claude & Hess patent-in-suit, No. 664,383, is entitled, and is for, "Apparatus for Storing and Distributing Acetylene Gas," and in this respect differs from the subject-matter of the application by the same Claude & Hess, serial No. 625,581 (which application was rejected by the Patent Office and finally abandoned by the applicants) entitled "Method of Storing Acetylene Gas for Distribution."

The specification of the patent-in-suit describes and the drawings illustrate an apparatus for the storage and distribution of acetylene gas, consisting of a closed receptacle or tank, a, divided into two separate and distinct compartments by a cross wall or partition d^3 "near the upper portion of the receptacle a." Each of these two compartments has its special office and use, the lower one "which is below the said partition" being intended for holding the solvent "such as alcohol or acetone capable of dissolving acetylene gas," and the dissolved acetylene, and the upper compartment, or portion above the partition, "forming a reservoir for the gas," which is allowed to pass into this reservoir from the compartment below, through the kind of valve known as a reducing-valve. This type of valve, which is well known and has long been in use, especially in the control of the flow of gases, is an essential feature of the construction described and illustrated in the Claude & Hess patent No. 664,383, "in order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure, the pressure of the gas within the reservoir of course decreasing as the gas passes out therefrom" (lines 92 to 97 page 1 of specification).

For charging the tank or receptacle a with acetylene gas there is provided "an inlet-tube a^2, having a suitable coupling a^3 for connecting the same to the gas supply pipe A, shown as pro-
82 vided with a controlling valve A^2," "the said inlet-tube being also provided with a valve or cock a^4." The inlet tube a^2 is extended down through the upper compartment, and the dividing partition "nearly to the bottom of the receptacle a^2" and its lower compartment containing the solvent, so that the gas is admitted at a point near the bottom thereof and rises through the liquid as it enters "in order to facilitate the process of solution." To discharge the gas from the upper compartment there is "an outlet passage provided with a coupling c^2 for the purpose of connecting it to the pipe system leading to the burners which are to be supplied or to a single burner, and a valve c^3 adapted to be opened after the receptacle is properly coupled for use."

The specification shows that this apparatus is adapted and intended "to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated", that shown in fig. 1 being intended apparently for supplying the few burners of a single room, and that disclosed in fig. 2 being for the larger number of burners in a whole building. From the language of the specification it appears that the use of this apparatus for automobiles and other vehicles was not contemplated.

To summarize the features of the Claude & Hess "Apparatus for Storing and Distributing Acetylene Gas", as described in the specification and illustrated in the drawings of the patent in suit, the following are set forth as essentials:

1. A "closed vessel or receptacle *a*", capable of holding a supersaturated solution of acetylene.

2. A "cross wall or partition d^3 near the upper portion of the receptacle *a*" dividing said receptacle into:

3. Two portions or compartments, "that portion of the receptacle which is below the said partition" being the larger on account of the position of the partition d^3 near the upper portion of the receptacle *a*, for "containing a fluid *b*, such as alcohol or acetone, capable of dissolving acetylene gas", and the portion above the partition d^3 "being normally empty and forming a reservoir for the gas."

4. "A reducing valve *d*, of any suitable or usual construction, interposed between the interior of the receptacle and the outlet *c* therefrom. As herein shown, the said reducing valve is in a passage" above the "wall or partition d^3."

As an essential result of the operation of this reducing valve, so placed, "It is obvious that through the agency of the reducing valve the pressure in said upper reservoir will be substantially uniform; so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the
83 receptacle is fully charged as when it is nearly exhausted."

5. This reducing valve must be "so positioned as to be normally above the level of said solution" *b*, in order that none of this solution will be forced or blown out with the gas as the latter passes through the reducing valve.

6. "An inlet tube a^2, having a suitable coupling a^3 for connecting the same to the gas supply pipe A, shown as provided with a controlling valve A^2." Through this inlet tube the "fluid *b*, such as alcohol or acetone", is charged into the lower compartment and the acetylene gas is forced in to be dissolved and stored in solution in the fluid *b*. "To facilitate the process of solution, the inlet-tube is extended downward nearly to the bottom of the receptacle *a*."

7. "An outlet passage *c*" for delivering the gas from the upper reservoir, which outlet passage is "provided with a coupling c^2 for the purpose of connecting it to the pipe system leading to the burners * * * and a valve c^3, adapted to be opened after the receptacle is properly coupled for use."

With these essential features of the Claude & Hess apparatus clearly set forth in the specification and illustrated in the drawings of the patent in suit in view, it is evident that any closed vessel or receptacle capable of holding a solvent "such as alcohol or acetone" and gas will not answer the requirements of the patent in suit. Nor will any closed vessel or receptacle otherwise suitable but having only one compartment, meet the requirements. There must be two portions or compartments, not side by side but one above the other, not of the same size nor, if of different size, the larger above the

smaller, but only the larger below the smaller. The partition separating these portions cannot be vertical nor inclined but must be a cross or horizontal partition, and it must be definitely placed "near the upper portion of the receptacle *a*".

Furthermore, the outlet for the gas held in solution cannot be placed in any position that would allow the gas to pass out. It is essential that the outlet be "so positioned as to be normally above the level of said solution", so that none of the solution will be forced or blown out with the gas. Any loss of the solution in this way would not only be waste but would interfere with the uniform discharge of the gas, besides leaving the remaining solution correspondingly less efficient for storage of acetylene gas.

Again, the means for controlling the outlet whereby the gas is allowed to escape therethrough, at substantially uniform pressure, cannot be any controlling valve. It is essential that a reducing valve be "interposed between the interior of the receptacle
84 which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." No other kind of valve will answer, for no other type of valve will meet the essential requirement "that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure, the pressure of the gas within the reservoir of course decreasing as the gas passes out therefrom."

Reducing valves have long been in use for special purposes, such as in the case of the apparatus of the patent in suit, and are well known and understood in the mechanic arts. All valves are used to control the flow of fluids, gaseous or liquid, in passages, and all can be used in such a way too that the pressure of the fluid on the delivery side is reduced from, or less than, that on the supply side. But this does not by any means make a valve a reducing-valve, as the term is properly understood and used. Ordinary valves are manually operated, that is the passageway of the valve is opened to its maximum limits or diminished to the point of closing, entirely by hand, and the pressure of the fluid on the delivery side varies with the pressure on the supply side. A reducing-valve, on the other hand, is automatic, or self-acting, in that the passageway adjusts itself to the varying pressure on the supply side in such a way as to keep the pressure on the delivery side substantially uniform. In other words, a reducing-valve is an automatic equalizing valve, and the term reducing-valve is always so understood in the mechanic arts.

The predominating idea, the essence as it were, of the Claude & Hess patent in suit is just this control of the flow of gas from the compartment or portion of the closed receptacle containing the solvent holding the gas in solution-storage, "whereby the gas is allowed to escape therethrough at substantially uniform pressure" into the pipes to the burners. The special type of valve, the reducing-valve, which alone of all valves is capable of fully accomplishing and insuring this essential quality of control, of uniform pressure on the delivery side, is and must be used "interposed between the interior of the receptacle and the outlet." The specification

states that a reducing valve "of any suitable or usual construction" can be used in this position, showing Claude & Hess recognized that reducing valves were old at the time of their application for the patent in suit, and that, while all of them accomplish the same kind of control, namely that resulting in uniform pressure on the delivery side, they differ somewhat in details of construction.

There may be some confusion and misunderstanding on the part of the general or lay public as to the meaning of the
85 term reducing valve, but there can be none, nor is there any lack of a definite, clear and correct understanding of the true and proper meaning and use of the term reducing-valve on the part of those skilled in the art to which the patent in suit relates, those to whom these letters-patent are addressed. The idea that by reducing valve is meant any valve capable of reducing the pressure on the delivery side below that on the supply side is erroneous and misleading. As already stated above, any valve accomplishes this much, and indeed it may be said that any plug or stopper does the same. A mere reduction of the pressure on the delivery side would not at all have served the purpose of Claude & Hess in their design of the apparatus of the patent in suit. What they wanted, and what was clearly the dominant feature in their minds for their apparatus, was not only a reduction of pressure but a pressure that would be substantially uniform no matter what the pressure might be on the supply side. If it was not this particular and special control of the gas delivery that they wanted there would have been no need of complicating their apparatus with an extra valve, and a complicated one too, and locating it in such an inconvenient position as at the opening in the partition inside the closed vessel. The ordinary valve c^3 outside would have been amply sufficient. As evidence, however, that they wanted equalization of pressure not merely the decrease of pressure such as any ordinary valve would supply, and that what they wanted was that particular kind of reduction which only a reducing valve gives, namely uniform pressure on the delivery side, independent of any variation of pressure on the supply side, they reiterate over and over again in the specification that the kind of valve for controlling the flow of gas in their apparatus must be a reducing valve. They not only mention reducing-valve specifically by name very many times in their specification and claims, and in addition several times make definite reference thereto by expressions such as "said valve", but besides this seven times in the specification and claims they describe and specify the particular kind of effect and control they intend shall be secured by the use of said valve, namely, as in the following language (lines 14 to 20, page 2): "It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted". In addition to all this there is shown in detail in the drawings of the patent in suit the mechanism peculiar to the usual construction of reducing-valve

and such as would exercise the kind of control specified in
86 the quotation just given above, from the specification.
Thus it will be seen the Claude & Hess patent not only specifies by name, giving the particular name by which the valve is known to those skilled in the art to which the patent in suit relates, but defines and describes the action of this particular valve and clearly illustrates it in the accompanying drawings. It is unmistakably evident, therefore, that no other kind of valve would answer the purpose or serve as an equivalent.

The Claims.

All the claims of the Claude & Hess patent No. 664,383 are drawn consistently and clearly in line with the dominant object in view as set forth in the specification, namely controlling the delivery of gas so that it will enter the pipes for use in the burners at a substantially uniform pressure. Every one of the six claims is limited specifically to the use, in combination with other elements, of a reducing-valve, which in claim 1 is denominated "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure," and in the other five claims by the name "reducing-valve." "Means for controlling" the gas "outlet whereby the gas may escape therethrough at substantially uniform pressure" is, as has already been fully shown, a reducing valve, and it would be so understood by those to whom these letters patent are addressed. It is clearly evident, therefore, that each and every one of the six claims of the Claude & Hess patent No. 664,383, is drawn intentionally and successfully in such language as unmistakably to limit this patent to a construction intended for and adapted to attain the one object so fully and definitely disclosed in the specification, namely, to control the flow of acetylene gas from its solution-storage in the solvent *b* into the "pipe system leading to the burners" under a "substantially uniform pressure, only slightly above the atmospheric pressure," this "pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted." We may now consider and analyze the six claims of the Claude & Hess patent, No. 664,383, separately.

Claim 1.

As an apparatus the elements claimed in claim 1 are: (1) "A closed vessel"; (2) "having an outlet"; and (3) "means for controlling said outlet." There is considerable additional descriptive matter in this claim which has the effect of setting forth limitations, as follows: (1*a*) The closed vessel shall be one of "con-
87 taining a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure," i. e., the "closed vessel" must be strong; (2*a*) the "outlet" must be such that the acetylene gas can "escape from the solvent when the pressure is released"; and (3*a*) the "means for controlling said outlet" must be automatic equalizing means, "whereby the gas may escape therethrough at substantially uniform pressure." By the use of the concluding words "substantially as described," direct reference is made

to the specification, where full information is given to show the character and operation of the "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure."

As already shown, supra, in considering and explaining the specification of this Claude & Hess patent No. 664,383, the "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" must of necessity be automatic, self-adjusting, and of the construction known and understood in the mechanic arts as a reducing-valve. No other form of control or type of valve will meet the requirement specified and claimed in claim 1 namely, "whereby the gas may escape therethrough at substantially uniform pressure." This is more fully set forth and specifically stated in the specification, in the following language (lines 50 to 63, page 1): "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." If any other form of valve or stopper than the well known reducing valve were used to control the escape of the acetylene gas from the solution-storage in the solvent *b* in receptacle *a* of the construction of this patent in suit, said gas would, with any degree of opening of said valve or stopper, rush out with a force commensurate with the pressure of the gas set free from the solvent, and as this pressure on the supply side of the outlet would diminish as the amount of acetylene remaining in the solvent diminished, the gas would escape through the outlet not "at substantially uniform pressure" as claimed in claim 1, but the varying pressure with great force when the vessel is fully charged and with hardly any force when nearly exhausted, and thus not
88 meet the requirements of any claim, nor respond to any description in the specification, of the patent.

The idea cannot be accepted that claim 1 is broader than the other claims of the patent in suit, in that it is not limited to the use of an automatic equalizing reducing valve, but that, as shown by present practice, any ordinary valve, such as a needle valve, not only reduces the pressure of the gas but does it in such a way that the pressure is sufficiently uniform for satisfactory use at the burners. The essential point is not what may be done now in the light of later experience and knowledge, but what was actually claimed by Claude & Hess in their patent, and what in consequence was granted them in the letters-patent, No. 664,383. It is evident that Claude & Hess not only had no idea of using any other than an automatic equalizing valve, but that they did not believe any other kind of valve could control the outlet "whereby the gas may escape therethrough at substantially uniform pressure" for the purpose for which their apparatus was intended. This is shown clearly by reference to

the record of the application filed March 1, 1897, serial No. 625,581, for "Method of Storing Acetylene Gas for Distribution" and the record of the application for the patent in suit. In their brief for applicants in the method application, the attorneys used the following language in describing their invention:

"So here, applicants begin with a gas. They bring it into contact with a solvent, the gas being then under pressure, whereby it is caused to be dissolved in and to form with the liquid a solution of the gas. This solution is transported or conveyed to a distant point for use and, arrived at such point, the gas is restored to its original condition by venting the holder and permitting the gas to separate out of the liquid. Here again, however, such separation must be effected or permitted under regulation and control, since to permit its free and unlimited escape would be to prevent the proper utilization of the gas, and to cause a waste thereof; hence such escape or separation out of the liquid must be under carefully regulated control. This regulation and control is effected (as fully set forth in the companion application referred to in this) by the automatic reducing valve, whereby the escape opening is proportioned to the pressure of the gas, being smallest when the pressure is greatest, and vice versa." The application for the patent in suit is the "companion application" mentioned above.

Again in the application for the patent in suit the attorneys for applicants in their argument for applicants before the Primary Examiner use the following language: "Two applications were
89 filed in the joint names of these petitioners— * * * —
one for Apparatus for Storing and Distributing Acetylene Gas and the other for Method or Process thereof. Briefly stated, the apparatus consists of a strong vessel having a horizontal diaphragm provided with an opening controlled by an automatic pressure-regulating valve—that is to say, by valve which opens less or more according as the pressure is greater or less, and thus maintains a practically constant outflow of gas at a pressure but slightly above that of the atmosphere. The vessel is further provided with cock closing the upper chamber into which the gas enters through the automatic valve, so that delivery of gas may be wholly cut off if desired, and it is furnished with a charging tube extending to near the bottom of the lower chamber of the vessel and provided with suitable cocks."

Such unmistakable language as used in the two quotations given above effectually disposes of any idea that Claude & Hess had a thought or believed it possible to use any other than "an automatic pressure-regulating valve" when in claim 1 of the patent in suit they did not claim specifically a reducing valve, but used the language they had repeatedly used in the specification to describe the action of such reducing valve, namely, "whereby the gas may escape therethrough at substantially uniform pressure, substantially as described."

Claim 2.

In claim 2 the elements claimed are: (1) "A tight shell or vessel"; (2) "a solvent of acetylene contained within said vessel"; (3)

"and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution"; and (4) "a reducing valve," "provided at a point above the solvent."

It will be seen that claim 2 differs from claim 1 in directly claiming as elements of the combination the "solvent of acetylene" and "acetylene dissolved in and held by said solvent under pressure and constituting therewith a super-saturated solution," whereas, in claim 1 these are not properly elements of the combination, but descriptive statements to the effect that the "closed vessel" contains "a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure" and acetylene gas which escapes from the solvent when the pressure is released or reduced."

Claim 2 is limited specifically not only to "a reducing-valve," but to the place at which the reducing-valve is located, namely, "at a point above the solvent." These limitations are fully in accord with the specification, both as regards the construction described and the purpose for which this is adapted. The first limitation, the use of a reducing valve, is to secure (as repeatedly stated in the specification, it is the desire and object of the patentees to effect) the delivery of the gas "to the pipe system leading to the burners" at "substantially uniform pressure only slightly above atmospheric pressure" and the second limitation, that of the location of the reducing valve "at a point above the solvent" follows the specification (page 1, line 26 et seq.), which states that it is an essential of the invention of this patent that the outlet for the gas must be "so positioned as to be normally above the level of said solution." To the minds of the patentees, as it must be evident to any one, whether or not skilled in the art to which this patent relates, it is necessarily an essential of such a construction as described and claimed in the patent in suit that the outlet for the gas must be located "at a point above the solvent," as otherwise the gas in escaping would force out and waste so much of the heavier fluid *b*, forming the solution-storage for the gas as this reaches the outlet, as has already been fully pointed out, supra.

Claim 3.

Claim 3 calls for an apparatus, such as is described in the specification, "for storing gas and delivering it at a substantially uniform rate," with the following limiting elements, in combination with "a shell or vessel *a* containing a supersaturated solution of gas": (1) "a valved inlet-pipe a^2 extending to a point near the bottom of the chamber *a*"; (2) a horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2"; (3) a "reducing valve *d* applied to said opening"; and (4) "a valved outlet pipe *c* through which the gas after passing the reducing-valve may escape to the main or distributing pipes."

As compared with claims 1 and 2, the special features claimed as elements in claim 3 are: a "valved inlet-pipe a^2 extending to a point near the bottom of the chamber *a*" for charging the apparatus, "a valved outlet-pipe *c*," to be connected with "the main or distributing pipes," for supplying the burners; and "a horizontal

diaphragm d^3 extending across the chamber in its upper portion and provided with a passage $d^{3\prime\prime}$", which means that two chambers are claimed. The all-important feature of the means for securing the kind of control essential to the apparatus, a reducing valve, is in this claim 3 also, as well as in claims 2, 4, 5 and 6, specifically named and claimed.

91

Claim 4.

Claim 4 has the following limiting elements: (1) "a vessel containing a supersaturated solution of gas," which vessel must have two chambers, the lower of which is the "solvent-chamber"; (2) "an inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent"; (3) "an outlet-opening from the solvent-chamber above the level of the solvent"; and (4) "a reducing-valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity."

Claim 5.

Claim 5 differs from all the other claims in specifically limiting the solvent to "acetone," the other claims not mentioning acetone as the solvent but using the term "solvent" as meaning solvent for acetylene, "such as alcohol or acetone," as described in the specification, for a "supersaturated solution" of acetylene. A "reducing valve" is called for specifically, with the limtiation, similar to that in claim 2, that it shall be applied to an opening "above the level of the solvent," which as already pointed out, is one of the essentials of the apparatus of this patent, being particularly specified at lines 27, 29 to 31, page 1 of the specification, in the following language: "the present invention consists, essentially, in a closed receptacle * * * having an outlet for the gas so positioned as to be normally above the level of said solution."

Claim 6.

Claim 6, like claims 2, 3, 4, and 5, is specifically limited to the use of a "reducing-valve," and in addition is still further limited, as is claim 3, in that it is required that the said reducing-valve must be applied "to an outlet for gas in the upper part of said chamber." This claim 6 is further, like claim 3, more narrowly limited than the others of the patent in the requirement of "means for temporarily sealing the vessel completely," which refers to the "valve c^2 in the valved outlet c" as expressed in claim 3.

The above analysis of the specification and claims of the Claude & Hess patent, No. 664,383, having established a clear understanding of the meaning and scope of the claims of said patent, we may now examine and consider the construction of the defendant's device and determine to what extent, if any, it falls within the

92 scope of the claims of this Claude & Hess patent in suit.

First, however, it will be interesting and illuminating in this connection to examine and consider the construction and operation

of a device which the evidence before this court shows is in use by complainants, and being sold by one of them in large numbers as "Prest-O-Lite" tanks and is referred to by them as "complainants' tank". As this device is not patented, and, of course, is not an infringement of the Claude & Hess patent in suit its consideration will materially aid as a guide in determining more clearly whether defendant's device falls within the scope of any of the claims of the patent in suit and hence infringes said patent.

[redacted]

Complainants' Gas Package.

The gas package, konwn in the trade as a "Prest-O-Lite tank," is shown in the drawing marked "Defendant's Exhibit No. 1": fig. 1 being a longitudinal side elevation, fig. 2, a front end elevation, fig. 3 a longitudinal section, fig. 4, a rear end elevation, and fig. 5, a longitudinal section (along the plane represented by the line 3-3, fig. 2) of the outlet mechanism This tank is shown to be filled with blocks of an absorbent filler, in four sections, and to be partly filled, as denoted by the yellow color, with the solvent "alcohol or acetone." There is no "diaphragm", "wall or partition", "horizontal" or otherwise, "near the upper portion of the receptacle", or elsewhere. There is no reducing-valve in any part of the tank, and hence, of course, not located at the out-let for the acetylene gas "at a point above the solvent" or elsewhere. The outlet passage is controlled by the type of valve known as needle valve, which is not a reducing valve as the latter term is understood and used by those skilled in the art to which this device relates, a needle valve being not an automatic or self-adjusting equalizing valve, but a hand-operated valve which cannot exercise that kind of control of the fluid passing therethrough which will result in the gas being "delivered under a substantially uniform pressure". Gas passing through a needle valve, as through any ordinary valve, varies in pressure on the delivery side as the pressure on the supply side varies, that is, gradually decreases. Another notable feature of this "Prest-O-Lite" tank is that there is no inlet-tube "extending downward nearly to the bottom of the receptacle", nor, to any extent, in the receptacle, there being no tube of any kind for charging. We may now see to what extent, if any, the claims of the Claude & Hess patent No. 664,383 can be read upon this device, the "Prest-O-Lite" gas package.

93 Considering this tank to be "a closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure", we find that while said vessel has "an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced" there are entirely wanting any such "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure", nor is there any mechanical equivalent of such means. The valve c^3, shown in the drawing as located in the outlet passage c, cannot be considered as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure"; but is incapable by any manipulation of providing such a result. The

only control exercised by the valve c^3 is to let the gas escape under gradually decreasing pressure as the supply of gas in the tank diminishes, thus defeating the main object set forth in the specification of the patent in suit and specifically claimed in claim 1 thereof. The "Prest-O-Lite" tank shown in the drawing marked Defendant's Exhibit No. 1 is, therefore, not an infringement of claim 1 of the Claude & Hess patent, No. 664,383.

If we compare claim 2 of the Claude & Hess patent, No. 664,383, with the construction shown in the drawing herewith, marked Defendant's Exhibit No. 1, and assume that the tank shown in this drawing is a tight vessel containing "a solvent of acetylene" and "acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution", it is clear that the "Prest-O-Lite" tank construction, shown in Defendants' Exhibit No. 1, does not respond to the requirements of claim 2 of the Claude & Hess patent No. 664,383, and hence does not infringe said claim 2 for the reason that the most essential element of claim 2 namely "a reducing-valve" is not present, nor is there any mechanical equivalent of it present in the "Prest-O-Lite" tank construction. The only valve present in this construction is that marked c^3 in the drawings, "Defendants' Exhibit No. 1," which is an ordinary hand-operated valve, not capable of delivering the gas, after passing therethrough, "at a substantially uniform pressure," but at a gradually diminishing pressure only, as has already been fully shown.

The construction called for by claim 3 of the Claude & Hess Patent No. 664,383, differs materially from that illustrated in the drawing marked Defendants' Exhibit No. 1, assuming the tank shown in said drawing to be "a shell or vessel containing a supersaturated solution of gas." There are four necessary elements called for by claim 3 which are not found in the construction of said
94 drawing, namely: (1) The apparatus shown in said drawing, although "for storing gas" is not capable of "delivering it at a substantially uniform rate," as required by claim 3; (2) the "valved inlet-pipe a^2" is not present in the tank of the drawing, and in consequence, there is no "valved inlet-pipe a^2 extending to a point near the bottom of the chamber a"; (3) there is no diaphragm d^3, or of any kind in the apparatus of the drawing, and hence none that is "horizontal," "extending across the chamber" "near the upper portion" or any other portion; and (4) there is no "reducing-valve d applied to said opening" d^2. The only element of claim 3 that is present in the tank of the drawing besides "the shell or vessel a," is the "valved outlet pipe c."

Claim 4 also claims a construction differing in an important degree from that shown in the drawing marked "Defendant's Exhibit No. 1." Although the tank of the drawing is assumed to be "a vessel containing a supersaturated solution of gas" it is far from being the "apparatus for storing and delivering gas" called for by claim 4. There is in the construction of the drawing (1) no "inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent"; (2) no separate "chamber provided for the solvent"; (3) no "outlet opening from the solvent chamber above

the level of the solvent", nor is there (4) any "reducing-valve, applied to said outlet and serving to permit escape of gas in regulated and uniform quantity." The only outlet valve in the construction of the drawing, marked Defendant's Exhibit No. 1, is the valve c^3 which is an ordinary hand-operated valve, not capable of permitting "escape of gas in regulated and uniform quantity", but only in gradually decreasing quantity, as the pressure on the supply side decreases.

If we compare claim 5 of the Claude & Hess patent with the tank of the drawing marked "Defendant's Exhibit No. 1", we find, also, a marked diffentiation, assuming said tank to be a "holder or tight vessel", "containing a charge of acetone" and "a volume or body of gas dissolved by and compressed and contained within the solvent". In the tank of the drawing referred to there is not present any reducing-valve applied to any opening and hence none "applied to an opening extending to the interior of the holder above the level of the solvent". It is clear, therefore, that the tank of said drawing does not infringe claim 5 of the Claude & Hess patent.

Claim 6 also calls for a structure which differs from that shown in the drawing marked "Defendant's Exhibit No. 1". "The herein-
described holder for gas", claimed in claim 6, is described
95 in the specification as having two separate chambers, one for the solvent of the gas and the other for the gas escaping from the solvent. The tank of the drawing referred to has but one chamber, there being no diaphragm or partition dividing it; there is also in said tank no "outlet for the gas in the upper part of said chamber" holding the solvent, and there is no "reducing-valve applied to said outlet." The only element of claim 6 besides the "tight vessel", found in the tank of the drawing marked "Defendant's Exhibit No. 1", assuming said tank to contain "a solvent of the gas" and "adapted to receive a charge of gas under pressure and to form therewith a supersaturated solution" is "means for temporarily sealing the vessel completely," that is valve c^3. There is thus seen to be no infringement of claim 6 or of any claim of the Claude & Hess patent, No. 664,383, by the apparatus shown in the drawing herewith marked "Defendant's Exhibit No. 1," which apparatus, sold by one of the complainants as "Prest-O-Lite" tank, is complainants' tank and which has been herein shown not to be manufactured in accordance with the patent in suit.

Defendants' Storage Tank.

Although complainants' gas package, the "Prest-O-Lite" tank, is seen to differ essentially from the structure called for by the Claude & Hess patent, No. 664,383, so that it is unmistakably differentiated from, and admittedly in no way infringes, said patent, it will now be made clear that defendant's tank, not only exhibits the differences shown to exist between the "Prest-O-Lite" tank of the complainants and the apparatus of the Claude & Hess patent, but that there are in addition still other points of difference which have the effect of removing defendant's tank still farther than complainants' "Prest-

O-Lite" tank is from infringement of the Claude & Hess patent No. 664,383.

Defendant's tank is shown in the drawing marked "Defendant's Exhibit No. 2," in which Fig. 1 is a side or longitudinal elevation, Fig. 2 a front end elevation, Fig. 3 a longitudinal section (along the plane indicated by the line 3-3, Fig. 2), Fig. 4 a rear end elevation, and Fig. 5 an enlarged longitudinal section through the mechanism of the gas outlet and its control. If we compare the claims of the Claude & Hess patent No. 664,383 with the tank shown in said drawing we will find that this tank of the defendant company differs from that called for in the claims of said patent not
96 only in structure but as well in principle, purpose, and operation, as will be made evident by the following examination:

Claim 1.

Claim 1 of the Claude & Hess patent No. 664,383, as already shown, is for the following structure: (1) "A closed vessel," which the added description states, is to contain "a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure"; (2) "an outlet" in said vessel "for the acetylene gas which escapes from the solvent when the pressure is released or reduced"; and (3) "means for controlling said outlet", which "means" are limited and restricted to only such "means" as control the outlet in a way to ensure the result "whereby the gas may escape therethrough at substantially uniform pressure." Reference back to the specification of this patent shows unmistakably that the "means" here claimed and defined refer to a reducing-valve, as will be seen from the following language (lines 50 to 60, page 1): "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." This is further made evident by the following language of the specification (lines 13 to 20, page 2): "It is obvious that through the agency of the reducing valve the pressure in said upper reservoir will be substantially uniform, so that the gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted." It is plain that the reducing-valve, thus referred to in the specification and so clearly called for by the language of claim 1 as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described" in the specification, must be, as illustrated in the drawing of this patent, an automatic, self-acting, equalizing valve, and only such as has long been known by those skilled in the mechanic acts by the term "reducing valve."

That the patentees of the patent in suit had in mind only, and

intended no other form of valve than, an automatic pressure regulating and equalizing valve when they used the term "reducing-valve" or described the kind of control required for the
97 outlet of the gas, has already been made clear from the language used and quoted above from the description of their apparatus given by applicants in their applications for the method or process patent and for the patent in suit. Such a reducing-valve is, therefore, not a valve that merely controls the outlet whereby, or in such a way that, the gas may escape therethrough at a reduced pressure. As already shown, any ordinary valve does this, and indeed any plug or stopper is capable of this control and must necessarily cause the gas to escape at a gradually decreasing pressure. This, however, is very different from the kind of control absolutely required by claim 1 and forming the essential feature of the Claude & Hess patent No. 664,383, namely, "whereby the gas may escape therethrough at substantially uniform pressure."

Turning now to defendant's tank, as shown in the drawing marked Defendant's Exhibit No. 2, it will be seen that the outlet is not provided with a reducing-valve, nor with any valve that could by any manipulation or method so control the gas outlet whereby the gas may escape therethrough at substantially uniform pressure.

It cannot be accepted as a correct contention that claim 1 is broader than the other claims of the patent in suit in that it is not limited to the use of an automatic reducing valve, but that, as shown in the acetylene lighting tanks for automobiles now in use, any ordinary valve, such as a needle valve, not only reduces the pressure of the gas but does it in such a way that the pressure is sufficiently uniform for satisfactory use at the burners, and hence falls within the scope of claim 1, since such ordinary needle valve delivers the gas at a pressure sufficiently uniform for the purpose to be "substantially uniform." It has been already pointed out that the valve to deliver the gas at a "substantially uniform pressure," as intended by the patentees of the patent in suit, is an automatic pressure equalizing and regulating-valve, and that the purpose for which their apparatus is to be used is "to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated"—in other words, in a fixed position, and that they did not contemplate or intend the apparatus to be used on moving vehicles. Furthermore, it is obvious the apparatus of the patent in suit is not adapted to be used on moving vehicles, especially automobiles, but if it could be used on automobiles the necessity for such control, as only an automatic pressure regulating valve gives, is still more a
98 necessity where the apparatus is used in a fixed position. When used on automobiles, if such use was possible, the motion of the vehicle incidental to irregularities of the road traversed, which motion is irregular, constantly repeated, and often more or less violent, would give such movement to the mobile liquid solvent as to quickly and greatly vary, and thus so vary the pressure of the gas at the burners as to objectionably affect the flow. No ordinary valve would be capable, in such a case, of controlling the pressure of gas sufficiently, and only a reducing valve, as described,

illustrated, and claimed in the patent in suit, and defined in same by Claude & Hess as "an automatic pressure regulating-valve" would be able to exercise that quality of control required, and which they claim in claim 1 is essential to their apparatus, namely, "whereby the gas may escape therethrough at substantially uniform pressure, substantially as described." The present day acetylene lighting apparatus for automobiles as illustrated by the Prest-O-Lite tank of complainants, shown in the drawing marked "Defendant's Exhibit No. 1," and by defendant's tank, showing in the drawing marked "Defendant's Exhibit No. 2," is widely different from the Claude & Hess apparatus of the patent in suit, not only in structure, but in operation and the uses to which it is adapted. The patent in suit contemplates the presence in a tank or receptacle of a body of liquid not completely filling such tank or receptacle and, therefore, free to move about upon agitation of the tank or the slightest movement of the tank. The patent in suit contemplates that at all times when in use these tanks containing a supersaturated solution of acetylene gas shall be stationary, and that, therefore, the liquid within them will be in a state of rest. Manifestly, if mounted upon an automobile, the liquid within these tanks will not be at rest, but, on the contrary, will be violently agitated. The porous filler for such tanks of acetylene gas, described and illustrated in the Fouché patent No. 727,609, is, therefore, an absolute necessity for tanks of acetylene gas for use for lighting the headlights of automobiles, as only by that means can the liquid be rendered immobile, so as to prevent objectionable jumping of the light. Without the porous filler of said Fouché patent to render the liquid immobile, the solvent would, naturally, flow into the pipes leading to the burners and would be wasted with the exit of the gas. The automobile acetylene gas tanks are able to use needle valves only because of the presence in the tanks of the porous filler of the Fouché patent, and would be not only unpractical but inoperative if the bare apparatus of the patent in suit were mounted on an automobile and a needle valve
99 substituted for the reducing-valve demanded by the Claude & Hess patent in suit. The automobile acetylene gas packages have been developed as a result of added years of experience and increased knowledge as well as of continued effort to meet conditions so markedly in contrast with those for which the Claude & Hess apparatus of the patent in suit was intended and is adapted, namely, in a fixed position "to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated." The automobile acetylene lighting tank with its absorbent filler holding the liquid solvent immobile, so that it is not affected by the shock, jar, or other irregular motion of the moving automobile, and thus no undue, sudden, or marked variation of the pressure can result, is capable of delivering the gas through an ordinary needle valve with sufficiently uniformity of pressure to give a satisfactory light for such vehicle. It must be remembered, however, that "a substantially uniform pressure" at the burner of an automobile lamp is not required, as the light thrown forward from the reflector, behind the burners, is in constant motion, more or less irreg-

ular, giving in consequence an unsteady, dancing light, and any change in the flame due to the gradually decreasing pressure of the gas would not be noticed, except as the supply of gas in the tank approaches exhaustion. In this latter case it is desirable that there should be a gradually decreasing pressure at the burners, and hence diminishing flame, to warn the driver of the machine against getting too far away from a source of renewal supply before his lights go out for lack of gas. With an automatic reducing valve on the tank in place of the needle valve, no such warning would be given, as the pressure would be "substantially the same when the receptacle is fully charged as when it is nearly exhausted." It is evident then that furnishing light for automobiles is such an entirely different use, for which the Claude & Hess apparatus of the patent in suit is not adapted, that it cannot serve as an illustration to appeal to as showing that an ordinary needle valve meets the requirements of claim 1 of the patent in suit as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described," in the specification, and illustrated in the drawings of said patent in suit. Claim 1, therefore, cannot be considered to be broad enough to cover the use of an ordinary needle valve, but is only broader than the other claims which specifically name "a reducing valve" as an essential element insofar as to include other "means for controlling said outlet" that can deliver the gas at as "substantially uniform pressure" as a reducing-valve.

Turning now to defendant's tank, as shown in the drawing marked "Defendant's Exhibit No. 2," it will be seen that the outlet is not provided with a reducing valve, nor with any valve that could by manipulation or method of operation be the "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." The valve shown in said drawing for controlling the outlet is only a valve of the ordinary type known as "needle valve," which is not automatic or self-adjusting or capable of an equalizing function, but is hand operated, and is capable only of varying the size of opening through which the gas passes, being without any mechanism that could deliver the gas "at substantially uniform pressure." Being capable only of varying the size of the outlet for the gas, this needle valve can only deliver the gas passing therethrough at a pressure which is gradually diminished. The main essential feature of the Claude & Hess patent, No. 664,383, and claimed in claim 1 of said patent, namely "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" is absent. It follows, then, that, assuming defendant's tank as shown by drawing marked Defendant's Exhibit No. 2 to be a closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said tank is clearly differentiated from the structure described in the specification, illustrated in the drawings, and claimed in claim 1 of the Claude & Hess patent No. 664,383, and hence there can be no infringement of said claim 1 by said defendant's tank.

Claim 2.

It has been shown above that defendant's tank, as illustrated in the drawing marked "Defendant's Exhibit No. 2," does not contain any reducing valve or any mechanical equivalent thereof; hence it is evident the use of said tank would not be an infringement of claim 2 of the Claude & Hess patent, No. 664,383, because said claim 2 not only calls for a reducing valve by name, but the use of the words "substantially as and for the purpose set forth" following the naming of "a reducing valve" definitely refers to the specification that there may be no misunderstanding of the kind of valve meant by the term "reducing-valve" or of the use for which it is intended. For the purpose of emphasizing so important and
101 essential a feature of this patent, the description and explanation of the reducing valve and its action are several times repeated, as (1) at lines 50 to 63, page 1, in the following language: "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use"; (2) at lines 92 to 100, page 1, as follows: "In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure (the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom), a reducing-valve d of any suitable or usual construction is interposed between the interior of the receptacle and the outlet c therefrom. As herein shown, the said reducing-valve is in a passage d^2 connecting the spaces below and above a wall or partition"; (3) at lines 8 et seq., page 2, in the following language: "In order that the reducing-valve d may be set or adjusted to respond to any desired pressure the vessel a is shown as provided with a removable plug d^4, through which access may be had to the adjusting-stem d^5 of said valve. It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

Not only is there in defendant's tank no reducing-valve, nor any mechanical equivalent thereof, nor any valve or mechanism capable of producing the action or result so definitely and repeatedly described and explained, as above, in the specification of the Claude & Hess patent, No. 664,383, but furthermore assuming defendant's tank to be a tight vessel containing "a solvent of acetylene" and "acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution," there is no valve of any kind "provided at a point above the solvent," as called for in claim 2 of said patent. The outlet for the gas and the needle-valve

controlling said outlet (which needle valve is not a reducing-valve nor the mechanical equivalent of a reducing-valve) are not located "at a point above the solvent" but at a point half way be-
102 tween the bottom and the top of the solvent supply. This is, therefore, another and additional distinctive feature of defendant's tank, still further differentiating said tank from the structure described in the specification, illustrated in the drawings, and specifically claimed in claim 2 of the Claude & Hess patent No. 664,383. On account of this additional distinctive feature defendant's tank is even further removed from the structure claimed in claim 2 of said patent than complainant's Prest-O-Lite tank, shown in the drawing marked "Defendant's Exhibit No. 1." Said complainant's Prest-O-Lite tank, as shown by the drawing marked "Defendant's Exhibit No. 1," has, when placed in position as required by the words thereon "This side up," its outlet, as called for in claim 2 "at a point above the solvent."

It has already been pointed out above that in the tank of the Claude & Hess patent, and in complainant's Prest-O-Lite tank, it is necessary that the outlet be placed "at a point above the solvent," because in said tank a solvent, "such as alcohol or acetone," is used the nature of which solvents is such that if the solvent should reach the level of the outlet it would be blown out with the gas and wasted. So important was this placing of the outlet and reducing-valve "at a point above the solvent" thought to be to their alleged invention of the patent in suit by Claude & Hess that they used the following emphatic language in the specification of said patent (lines 26 to 31, page 1): "To this end the apparatus embodying the present invention consists, essentially, in a closed receptacle containing acetylene gas in solution and having an outlet for the gas so positioned as to be normally above the level of said solution." In defendant's tank, on the other hand, acetone is not used, but a new solvent for acetylene named "Terpeline" is employed, which, owing to its higher specific gravity and greater viscosity than acetone, does not blow and is not forced out of the outlet by the escaping gas, even when said outlet is placed much below the level to which the solvent "Terpeline" is filled in the tank. The outlet for the gas may, therefore, be placed at any level, and hence in defendant's tank it is placed at the center of end, since that is obviously the most rational and symmetrical position at which to place the outlet, when there is no objection to so placing, as there is in the case of the tank of the patent in suit and complainant's Prest-O-Lite tank, in which tank acetone is used as a solvent. In view, then, of the absence from defendant's tank of these two essential features called for in claim 2 of the Claude & Hess patent No. 664,383, namely "a reducing-valve" and "an outlet for the gas so positioned as to be
103 normally above the level of said solution," said defendant's tank clearly does not infringe claim 2 of said Claude & Hess patent No. 664,383.

Claim 3.

Defendant's tank differs very materially from the structure called for and claimed by claim 3 of said patent and there are four notable points of difference: First, defendant's tank is clearly, as already has been shown, not an "apparatus for storing gas and delivering it at a substantially uniform rate," there being no means connected in any way with defendant's tank to accomplish delivery at a substantially uniform rate, but only at a gradually decreasing rate. Secondly, defendant's tank has no "valved inlet-pipe a^2" and, therefore, none "extending to a point near the bottom of the chamber a." Thirdly, there is no diaphragm present in defendant's tank, and hence there is no "horizontal diaphragm extending across the chamber in its upper portion." Fourthly, there is no reducing-valve or any mechanical equivalent thereof applied to any part of defendant's tank. There is, therefore, no infringement of claim 3 of the Claude & Hess patent by the structure of defendant's tank.

Claim 4.

Defendant's tank is not constructed in accordance with claim 4 and is, therefore, not an infringement of said claim. Said tank differs from the apparatus called for by claim 4 (1) in having no "inlet pipe opening into said vessel near the bottom of the chamber provided for the solvent"; (2), having but one chamber, whereas claim 4 calls for two chambers; (3) in having no "outlet opening from the solvent chamber above the level of the solvent"; and (4) in having no "reducing-valve," or other valve "serving to permit escape of gas in regulated and uniform quantity."

Claim 5.

Claim 5 is limited to the use of acetone. Although the specification refers to alcohol as a solvent that could be used, such use of alcohol would be clearly outside the range and scope of claim 5, since said claim is limited to the use of acetone only. But in defendant's tank neither acetone nor alcohol is used. The solvent used is "Terpeline" which is a new solvent for acetylene, quite different in composition and characteristics, and with marked advantages over either acetone or alcohol as a solvent in acetylene gas storing and delivering apparatus. "Terpeline" has not only higher specific gravity than acetone but is a more viscous fluid, and hence is less mobile and less readily separated from the absorbent filler to which the solvent is applied. Furthermore, it is but slightly volatile at any temperatures to which it is liable to be exposed, and hence not inflammable, and not tending to clog the gas mains, in these respects also differing from acetone which is highly inflammable. It is, therefore, much superior to acetone as a solvent for use in tanks for storing and distributing acetylene gas, hence there is no use for acetone in defendant's tank, and none is used. Furthermore, there is the following marked difference between the structure of defendant's tank and that called for by claim

104

5 of the Claude & Hess patent No. 664,383. There is no "reducing-valve" present in defendant's tank, nor any valve "applied to an opening extending into the interior of the holder above the level of the solvent." In view of the absence of these elements of claim 5 in the structure of defendant's tank together with the fact that acetone is not used in said tank, defendant's tank lies clearly outside the range and scope of claim 5 of the Claude & Hess patent, No. 664,383.

Claim 6.

Claim 6 will not read upon defendant's tank, as it calls for a structure widely different from that of said tank, as shown in the drawing marked "Defendant's Exhibit No. 2." There are several points of material difference. First, claim 6 calls for a vessel with two chambers, the lower of which is "to receive a solvent of the gas," whereas defendant's tank needs, and has, but one chamber; secondly, there is no "outlet for the gas in the upper part of said chamber," as called for by claim 6, the outlet for the gas being, in defendant's tank, midway between the top and bottom of said tank, it being noted also that there is no "said chamber," meaning the lower of two chambers used for the solvent; and thirdly, there is no reducing-valve and no mechanical equivalent thereof, nor any valve applied to "an outlet for the gas in the upper part of said chamber," nor of any chamber. It may be pointed out, also that claim 6 requires that there be two valves, a reducing valve and "means for temporarily sealing the vessel completely." This is a materially different construction from that of defendant's tank, which, having but one chamber, needs, and has, but one valve, a needle-valve, that shown at 8 in the drawing marked Defendant's Exhibit No. 2, and in defendant's patent No. 987,000. With so many and such
165 material differences it is obvious that defendant's tank lies well outside the scope of claim 6 of the Claude & Hess patent, No. 664,383.

To sum up the points of difference between Defendant's tank, as shown in the drawing attached hereto and marked "Defendant's Exhibit No. 2," and the construction required by the patent in suit, it is clearly evident from the above comparison that there is a marked differentiation, as follows:

A. Claims 3, 4, and 6 of the Claude & Hess patent, No. 664,383, require a construction with two (2) chambers, such as shown in the drawings of said patent, formed by a cross wall or diaphragm near the upper portion of the receptacle. In defendant's tank there is but one chamber, there being no cross wall or diaphragm of any kind or in any portion of the tank.

B. Claims 3 and 4 call for an inlet pipe extending into the vessel near the bottom of the chamber provided for the solvent. Defendant's tank has no such inlet pipe nor any inlet pipe whatever.

C. Claims 2, 3, 4, 5, and 6 of the Claude & Hess patent, No. 664,383, each require, by naming it specifically, "a reducing valve," which as shown above, by the specific definition given by Claude & Hess themselves, they mean shall be understood to be "an automatic pres-

sure regulating valve." In claim 1 a reducing valve is not specifically named, but it is nevertheless unmistakably claimed, because it is an essential requirement of claim 1 that there shall be "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described," and this description is only that which applies to a reducing valve as above defined. Defendant's tank, on the other hand, has no reducing valve, nor has it any mechanical equivalent thereof, nor any "means whereby the gas may escape therethrough at substantially uniform pressure." It has only an ordinary valve, known as a needle valve, through which the gas can only pass at a gradually decreasing pressure.

D. Claims 2, 4, and 5 demand that the outlet for the gas shall be at a point above the level of the solvent, and claims 3 and 6 require that said outlet shall be in the upper part of the chamber containing the solvent. The outlet in defendant's tank is not placed at a point above the level of the solvent, nor at the upper part of the chamber. It is placed below the level of the solvent and at the middle of the end of the tank.

E. Claim 5 names specifically, and is limited to, the use of acetone as the solvent. Claims 1, 2, 4, and 6 call for a solvent, and, as the only solvents mentioned in the specification are alcohol and acetone, the term solvent as used in claims 1, 2, 4, and 6 must be understood as referring to these two solvents and not to any solvent of acetylene that might later be discovered. In defendant's tank neither alcohol nor acetone is used as the solvent, but a new and different solvent, "Terpeline," is employed.

106

The Prior Art.

It has been shown above that the use of the term "solvent" in claims 1, 2, 4, and 6 of the patent in suit applies to alcohol as well as acetone, while claim 5 specifically names acetone. The expression, "a supersaturated solution," employed in claims 1, 2, 4, and 6 and in the specification refers, of course, to the same solvents alcohol and acetone.

That all gases are soluble to some extent in liquids, that such solubility is always greater when the pressure is increased, and that in most cases the solubility is directly proportional to the pressure, have been matters of common knowledge for very many years. Indeed it may be said that since the English chemist William Henry made his well known investigation concerning the solubility of gases in liquids, and published the results in 1803, his conclusions, as stated above, have been generally accepted, and have served up to the present time as an acknowledged guide, being usually referred to as "Henry's Law." The effect of this generally diffused knowledge of Henry's Law is such that anyone will be led to expect, as the result of the experiment in the case of any newly discovered gas, that such gas would be soluble in various liquids, in some, of course, more soluble than in others, but in all cases where soluble the solubility would be greater as the pressure is increased and in a general way

the solubility would be found to be approximately in direct proportion to the pressure. It is even safe to say that in any practical operations, involving solution of a gas in a liquid, whether or not Henry's investigations or conclusions had ever been heard of, by those connected with the work—so instinctive almost has this knowledge become—there would be little or no hesitation in proceeding with operations with the assurance that the solubility of the gas would increase with the pressure and be expected to be approximately in direct proportion to the pressure.

I have examined the record in the case of the Commercial Acetylene Company vs. The Avery Portable Lighting Company (166 Fed. Rep. 907) and have noted the elaborate efforts of com-
107 plainant's experts, Prof. Hallock and Mr. Arthur Little, in their testimony in said case, to belittle the value and applicability of Henry's Law, giving quotations from Ostwold and other authors in an endeavor to support their contention. They have, however, utterly failed in this, and have not produced the slightest evidence to show that there is any exception whatever to the law that all gases are more or less soluble in liquids and that this solubility is greater when the pressure is increased. Such evidence as complainant's experts in said case do present is of camparatively little importance and merely goes to show that the increase in solubility is not always at all pressures in direct or equal proportion to the pressure. Magnifying beyond all reason this minor feature of the whole question as a basis for argument in opposition, they claim that Henry's Law is of no value or use.

As an illustration of the extreme language employed by the experts referred to, and the unwarranted conclusions arrived at, attention is called to the following from Prof. Hallock's second deposition, page 31, of the printed record entitled "Complainant's Pleadings and Proofs":

"Under these circumstances it does not appear to me that the existence of *the* Henry's Law affects in any way the novelty of the discovery of Claude & Hess as to the solubility of acetylene in acetone under pressures greater than atmospheric pressure. The law is of such limited applicability that its predictions in such a case would be without value and the real credit for discovering the fact must belong to the individuals who first experimentally discovered the fact and reported it. In this particular case (the solubility of acetylene in acetone) the uncertainty is increased by the possibility of some sort of chemical combination between the gas and the solvent, because the solution in general occupies a smaller volume than the sum of the volumes of the acetone and the dissolved acetylene, if condensed to a liquid. This in general, would indicate some sort of chemical action, perhaps analogous to the case of hydrochloric acid gas and water."

As a sufficient answer to all this contention on the part of Prof. Hallock it is only necessary to point out that, as a result of their experiments, Claude & Hess found (notwithstanding all the reasons Prof. Hallock gives to the contrary in the above quoted opinion)

only just what was to be expected from "Henry's Law." Thus they themselves say in their contribution to Comptes Rendus:

"This solubility of acetylene in various liquids increases nearly proportionately to the pressure. Thus under 12 atmospheres
108 one liter of acetone * * * dissolves about 300 liters of gas."

As one volume of acetone under one atmosphere dissolves (as they say) about 25 volumes of acetylene, we should expect from "Henry's Law" that under twelve atmospheres there would dissolve 25 times $12 = 300$ volumes, as they found. It would hardly appear, therefore, that any new discovery was made by Claude & Hess, but what they did was to confirm and prove by their experiments that, as was to be expected from "Henry's Law," the "solubility of acetylene in various liquids increases nearly proportionately to the pressure," to use their own language.

There is abundant evidence in the early literature to show that, no doubt through the general acceptance of "Henry's Law," and as the result of such investigations as had been made, the knowledge of the solubility of gases in liquids and of the solubility being proportional to the pressure was practically universal. The encyclopædias and text-books, whenever referring to such subjects, make definite statements to this effect, as might be shown by innumerable references, of which, however, a few citations should suffice:

The Penny Encyclopædia.

The Penny Cyclopædia of the Society for the Diffusion of Useful Knowledge published in London by Charles Knight & Co., in 1838, states, under the head of "Gas," on page 84, Vol. XI:

"The solubility of gases in water is extremely various. Dr. Henry ascertained that the volume of each gas absorbed by water is the same, whatever be the pressure to which the gas is previously subjected. If the weight of carbonic acid gas be doubled by subjecting it to the pressure of two atmospheres, water will still absorb its own volume of it."

After giving a table of the volumes of various gases absorbed by 100 volumes of water under the same temperature and pressure, the following statement is made:

"It may be observed that in general the more easily a gas is condensable by cold and pressure, the more soluble it is in water. This will appear by comparing the above statements with that containing the pressure at which Faraday liquefied various gases."

The Americanized Encyclopædia Britannica.

The Americanized Encyclopædia Britannica revised and amended, published in Chicago, in 1890, by Belford-Clarke Company,
109 in its article on Henry contains the following on pages 3105-3106, Vol. V.:

"In 1803 he published his elaborate experiments on the quantity of gases absorbed by water at different temperatures and under dif-

ferent pressures, with the result of establishing the law that 'water takes up of gas, condensed by one, two or more additional atmospheres, a quantity which would be equal to twice, thrice, etc., the volume absorbed under common pressure of the atmosphere'."

The New International Encyclopædia.

Not only in the older encyclopædias but in those of comparatively late date the same information is given as to the solubility of gases in liquids, and that this solubility is proportional to the pressure. As for instance "The New International Encyclopædia," published by Dodd, Mead & Company of New York in 1903, makes the following condensed but clear statement:

"The amount of gas absorbed by any liquid is proportioned to the pressure exercised upon the gas."

Even so late *is* 1910 "Nelson's Loose Leaf Encyclopædia" gives, under the heading "Absorption," the following:

"Absorption of gases by liquids depends on the pressure, the temperature and the nature of the particular gas and liquid. If the temperature remains constant and the pressure is altered, the amount of gas absorbed is directly proportional to the pressure. (Henry's Law)."

Thus it is seen the general applicability of Henry's Law is recognized and accepted at the present time as it has been for many years past.

Ganot's Elementary Treatise on Physics.

Some years ago one of the most prominent text-books on physics was "Elementary Treatise on Physics, Experimental and Applied" "Translated & Edited from Ganot's Elements de Physique by E. Atkinson, Ph. D., F. C. S., William Wood & Company, publishers, New York, 1890." Under the caption "Absorption of Gases by Liquids," Section 189, page 166, the following statement is made:

"Water and many liquids possess the property of absorbing gases. Under the same conditions of pressure and temperature a liquid does not absorb equal volumes of different gases * * * Gases are more soluble in alcohol; thus at 0°6. alcohol dissolves 4.33 volumes of carbonic acid gas. The whole subject of gas absorption has been investigated by Bunsen. The general laws are the following: 1. For the same gas, the same liquid and the same temperature, the weight of gas absorbed is proportional to the pressure."

Watts's Dictionary of Chemistry.

The edition of Watts's Dictionary of Chemistry published in 1875, gives on page 791 (Vol. 2) the following:

"The amount of gas absorbed by a liquid on which it exerts no chemical action is dependent (1) on the specific nature of the gas and of the liquid; (2) on the temperature at which the absorption takes place; and (3) on the pressure under which the absorption takes place."

Gas, By Pfeiffer.

In a German work, published in December, 1895, entitled "Das Gas von Pfeiffer," on page 20, the following statements are made:

"Liquids are able to absorb gases through their entire mass and in certain cases are capable of absorbing large quantities of the same. Here the law holds good that the quantity of the absorbed gas entirely depends on the pressure to which it is subjected. Thus a volume of water at ordinary temperature and approximately at atmospheric pressure absorbs approximately its equal volume of carbonic acid; at a pressure of 5 atmospheres the same absorbs five times its volume of carbonic acid." "When a liquid containing a gas absorbed in it stands in the open air all the gas gradually escapes and remains absorbed only in a closed chamber when the gas which has passed into the air exercises a corresponding back pressure on the absorbed gas."

German Patent to H. Loesner.

Reference may be made also to the German patent to Dr. H. Loesner in Leipzig for a "Process for Separating Chlorine from Gaseous Mixtures," dated December 13, 1894, published July 15th, 1895. This patent is based on the solubility of gases, especially under pressure, in liquids. The following is a translation of a part of the specification and of claim 1 of this patent, a certified copy of which will be filed herewith, marked Defendants' Exhibit No. 35.

"This invention consists in a process for separating chlorine from other gases with which it is mixed, after which it is susceptible of being compressed or used for other reactions. It is a known fact that chlorine cannot be compressed when obtained by the Deacon or similar processes, for the reason that it is too much diluted
111 with other gases, usually nitrogen. It has been found that a large number of organic bodies possess the faculty of absorbing chlorine at normal temperature, giving it off again at higher temperature, without being in the least affected by it.

"Such a body is nitrotonole. Even at normal pressure this body absorbs chlorine to the amount of 11% and above and gives it off again at higher temperature or reduced pressure. The faculty of absorption may be considerably augmented by increasing the pressure or reducing the temperature * * * From the chlorine solutions thus obtained pure chlorine is won by heating or by reduction of the pressure, and such gas may then be compressed or used for other purposes."

Claim 1. "A process for separating chlorine from gaseous mixtures, consisting in the fact that the gaseous mixture containing chlorine is passed through liquid organic bodies which at normal pressure and normal temperature are not affected by chlorine, and that from such solutions the chlorine is separated again by heat or by reduction of pressure."

Here we have the solution of a gas in liquids under pressure and the separation of the gas from the liquid by reduction of pressure,

similar in all essentials to the solution of acetylene in alcohol or acetone and the separation of the gas from the solvent by reduction of pressure.

The knowledge of the solubility of gases in liquids, so long and so generally diffused, has for many years been made use of in various industries for collecting gases, as in the catching of hydrochloric acid gas in towers where water trickles down, in the production of hydrochloric acid, and of nitrous gases from sulphuric acid chambers in the manufacture of this acid; in collecting sulphur dioxide gas and ammonia, in the solution of carbonic acid gas in water and other liquids forming the ordinary soda-water, beers, and wines. These are all familiar examples which hardly need the citation of references to prove their aptness as authentic illustrations of the familiarity of the public with such knowledge long prior to two years before the filing of the application for the patent in suit, and the use made of it in many industries. Some references, however, may be given out of the vast number available.

Roscoe & Schorlemmer's Treatise on Chemistry.

The well known standard "Treatise on Chemistry" of Roscoe & Schorlemmer, published in New York in 1891, gives the following on page 135 concerning the Manufacture of Hydrochloric Acid:

112 "This acid is obtained on the large scale as a by-product in the manufacture of soda-ash. In the alkali works 10 cwt. of salt is introduced in a large hemispherical iron pan, 9 feet in diameter, heated by a fireplace underneath and covered by a brickwork dome; upon this mass of salt the requisite quantity (10 cwt.) of sulphuric acid (sp. gr. 1.7) is allowed to run from a leaden cistern placed above the decomposing pan. Torrents of hydrochloric acid gas are evolved which collect in the space between the pan and the brickwork dome, whence they pass by a brickwork or earthenware flue into upright towers or condensers, built of bricks soaked in tar, or of Yorkshire flags fitted and clamped together. These towers, shown in vertical section in Fig. 34, and in ground plan in Fig. 35 are filled with bricks or coke, down which a small stream of water from a reservoir at the top of the tower is allowed to trickle. The gas, passing upwards, as shown in the figures by the [arrow] meets the water and is dissolved by it; and as the acid-liquor approaches the bottom of the tower it becomes more and more saturated with the gas."

Treatise on Beverages by Charles Herman Sulz.

In this well known Treatise on Beverages by Charles Herman Sulz, New York, 1888, on page 119 the following statement is made:

"We have already mentioned that water absorbs a greater amount of carbonic acid gas with increased pressure. It is found by experiment that this amount increases in proportion to the pressure as follows: At the pressure of one atmosphere (14.7 lbs.) the water will absorb its own volume; at the pressure of two atmospheres,

twice its own volume; at three atmospheres three times i-s own volume, and so on, until at about 540 lbs. to the square inch the carbonic acid gas itself becomes liquid, as was discovered by Faraday in 1823."

Also in the same work on page 123 is the following:

"As soon as the pressure in the cylinder gets diminished by letting escape its surface gaseous contents, a certain amount of the gas already absorbed by the liquid is eliminated in consequence of the decreased pressure."

Storer's "First Outlines of a Dictionary of Solubility."

As to the comparative solubility of gases in water and alcohol, Storer's "First Outlines of a Dictionary of Solubility," published in 1864, states on page 16:

"Alcohol generally takes up a greater quantity of gas bulk for bulk, than water."

113 Proceedings of British Association for the Advancement of Science.

Acetylene was first discovered by Edward Davy, and in a paper entitled "Notice of a New Gaseous Bicarburet of Hydrogen" communicated by him at the 6th meeting of the British Association for the Advancement of Science in 1836, as reported in the Proceedings, published the following year, Vol. 5, Part 2, pages 62-63, the author states:

"The new Gas * * * is slowly absorbed by water. The new Gas is absorbed to a certain extent by, and blackens sulphuric acid."

"Annales de Chimie et de Physique."

The well known French scientific publication "Annales de Chimie et de Physique" for 1866 shows that the solubility of acetylene in many liquids, including alcohol, which is one of the two solvents named in the Claude & Hess patent in suit, has long been known. In volume IX and at page 425 of that publication the following statement is made concerning the solubility of acetylene at about 18 degrees C.:

"Water, carbon disulphide and amylene hydrate dissolve about their volume of acetylene; illuminating petroleum, 1½ times its volume; essence of turpentine and carbon perchloride, 2 volumes; amylic alcohol and styrolin, 3½ volumes; chloroform and benzine, 4 volumes; and crystallizable acetic acid and absolute alcohol, nearly six volumes."

Wurtz's "Dictionary of Chemistry."

In Wurtz's "Dictionary of Chemistry," published in 1875, Volume 1, Part 1, page 43, practically the same statement is made, as follows:

"Solubility of Acetylene: Water, carbon disulphide and amylhydride dissolve about their volume of acetylene gas; illuminating

petroleum, 1½ times its volume; essence of turpentine and carbon perchloride, twice their volume; chloroform and benzine, 4 times their volume, crystallizable acetic acid and absolute alcohol about 6 times their volumes (Berthelot's Ann. de Chim. et de Phys. (4) Vol. IX, p. 424)."

"L'Incandescence par le Gaz et le Petrole"—Dommer.

So also in a French work received in the Library of the United Staes Patent Office January 26th, 1887, entitled "L'Incan-
114 descence par le Gaz et le Pétrole" by F. Dommer, and under the heading "L'Acetylene et ses Applications" a similar statement is made (page 164) of which the following is a translation:

"Water and carbon disulphide dissolve about their volume of acetylene gas. At 0° and under a pressure of 4.65 atmospheres, the coefficient of solubility is equal to 1.6; illuminating petroleum dissolves 1½ times its volume; essence of turpentine twice its volume; chloroform and benzine 4 times their volume; absolute alcohol and acetic acid nearly 6 times their volume; 100 volumes of water saturated with sea salt dissolves only 5 volumes of gas."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith designated Defendant's Exhibit No. 36.

Journal of the Franklin Institute.

The "Journal of The Franklin Institute," volume 139, published May 1, 1895, contains an article entitled "The Carbides and Acetylene Commercially Considered," by F. L. Willson and J. J. Suckert, Ph. D., in which the following statement is made, among others, concerning the nature and properties of acetylene:

"It is soluble in water in about the same proportions as carbon dioxide, that is, at 64° F. water will absorb its own volume of the gas. Absolute alcohol and glacial acetic acid dissolve about six times their volume."

Allen's "Commercial Organic Analysis."

The well known treatise "Commercial Organic Analysis," by Alfred H. Allen, F. I. C., F. C. S., American Edition, revised by Author and Prof. Henry Leffmann, Philadelphia, 1900, in Volume II Part II and at page 29, contains the following statement concerning the solubility of acetylene:

"Water dissolves about 1.1 times its volume, but a saturated solution of common salt dissolves only about 0.05 volumes. Alcohol dissolves about 6 volumes and paraffin about 2.5; *acetone dissolves a large amount.*" (Italics mine.)

If the author or revisers of this edition obtain a knowledge of acetone as a solvent for acetylene from the experiments of Claude and Hess, they certainly would have been likely to give the definite determination as they did in their statements concerning alcohol and paraffin. This indicates very strongly that the knowledge upon

which was based the statement "acetone dissolves a large amount" was from some source other and earlier than the experiments
115 of Claude and Hess, or any published reports of said experiments. And this Claude & Hess patent issuing December 25, 1900, it is obvious that the work from which I have just quoted antedates that date, and, therefore, anticipates that much of the disclosure of the patent in suit by as many months in 1900 as its date of publication preceded December 25, 1900. Defendant's Exhibit No. 37 shows that this publication was received at the Patent Office May 24, 1900.

The specification of the patent in suit names alcohol and acetone as solvents for acetylene gas, but from the above references it is clear that the solubility of acetylene in alcohol has been common knowledge for many years, and since long prior to two years preceding the filing of the application for the patent in suit, and there is evidence, also, that prior to the date of filing the application for the patent in suit it was known that acetone is a good solvent for acetylene gas. This evidence will now be presented.

I.

Reference to the record of the abandoned application for a Method patent shows that, notwithstanding all their efforts to meet the objections raised by the Patent Office, Claude & Hess at no time made any claim whatever, or even hinted, that they had made any discovery as to the solubility of acetylene in alcohol, acetone or any other liquid. On the contrary, they make the following unmistakable disclaimer, through their attorney, in a communication to the Patent Office, dated July 7th, 1897:

"It is not claimed on behalf of applicants that they have discovered, broadly speaking, a new property of gases in general or acetylene gas in particular, but only that they have discovered and invented a new, practicable, and safe method of storing acetylene gas, which consists in forcing the gas under pressure into a closed chamber containing a liquid which is a solvent thereof," etc.

And, further, their attorneys, in their brief for Claude & Hess, on the appeal before the Board of Examiners-in-Chief in said abandoned Method application, state:

"It is conceded that the idea of charging liquid solvents of different gases with such gases is old and well known, and further that the quantity of any given gas which will be taken up by a given solvent increases with increase of the pressure under which the gas is introduced."

116 And still again in the same brief they add:

"When such solvent is charged with gas under pressure, a supersaturated solution is produced, and, as above indicated, the broad idea of making a supersaturated solution of different gases with their solvents is a well established scientific possibility or fact. It may also be admitted that in the case of such supersaturated solution, the gas above or beyond the quantity required to effect such saturation will, if the upper portion of the vessel be vented, separate out of the solvent, and escape or flow off."

Not only is there nowhere in the specification or claims of the abandoned application for a Method patent any assertion, or even hint, that they had made any discovery in connection with the solubility of acetylene in acetone or any liquid, but there is nothing to indicate in the least that the alleged invention of the patent in suit lies in dissolving acetylene gas in alcohol or acetone, the liquids mentioned. As a matter of fact, shown clearly by an examination of the Patent Office records in the application for the patent in suit and of the abandoned application for the Method patent, the principle and essence of the alleged invention of the patent in suit, and of the Method patent sought in the abandoned application, reside in the operation of automatic means for permitting the escape of the gas at substantially uniform pressure. A statement to this effect is made in the following language, taken from the brief of the attorneys of Claude & Hess on the appeal to the Board of Examiners-in-Chief in their application for a Method patent, later abandoned:

"The fact that other things had to be done, that special adaptation and arrangement of apparatus had to be made in one or another form,—or in other words that some form of pressure reducing and controlling device must be used between the storage chamber and the point in use, shows that others had stopped short of the discovery or invention here involved."

There can be no doubt, then, that Claude & Hess knew they were not entitled to, and they did not make, any claim to any discovery as to the solubility of acetylene in acetone or any liquid.

II.

From the Dickerson patent, No. 662,258, dated November 20, 1900, it is evident that the solubility of acetylene gas under pressure in liquids, such as alcohol and acetone, was well known April
117 8, 1897, the date of filing the application. The specification states that the invention of this patent lies in the utilization, before dissolving the acetylene in such solvents as alcohol, fusil oil or acetone, of such excessive pressure applied to the acetylene gas as will liquefy the gas according to the well known process, and makes the following disclaimer (lines 45-52):

"I do not claim to be the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusil-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent."

It is evident that if on April 9, 1897, the date of filing the application for said Dickerson patent (the oath to it was executed April 2, 1897), such a statement as the above disclaimer was made, the solubility of acetylene in acetone must have been known for some time previous. But there is more direct evidence of this in the affidavits of Dickerson and Suckert in the file wrapper and contents of the Dickerson patent, and in the "Second Suckert Affidavit." Dickerson deposes, in his affidavit, that the invention of his patent was conceived in the year 1895, and that "at that time the invention

was reduced to practice by mingling liquefied acetylene with various solvents. * * * The reduction to practice of the invention was at that time complete."

Dr. Julius J. Suckert in his first affidavit deposes that he was "a co-inventor with Mr. Edward N. Dickerson in regard to several processes for the liquefaction of acetylene," and that at Dickerson's suggestion he, Suckert, in the year 1895, caused mixtures to be made of liquefied acetylene gas with a number of solvents." In the "Second Suckert Affidavit" Dr. Suckert says that at the request of Dickerson, he in April or May, 1895, made a series of tests to determine the solubility of liquefied acetylene in various solvents, among them acetone, and that as a result of these tests he found that acetone is capable of absorbing many times its volume of acetylene and that the supersaturated solution thus produced was non-explosive.

In view of the Dickerson patent No. 662,258, issued over a month before the patent in suit, the application having been filed April 8, 1897, and of the Dickerson and Suckert affidavits referred to above, showing the invention of the said Dickerson patent was conceived and reduced to practice as early as April or May, 1895, it is clear that the facts of the great solubility of acetylene under
118 pressure in acetone and of the non-explosive character of liquefied acetylene, when so dissolved, were known as early as 1895.

So far, then, as concerns the alleged discovery by Claude & Hess of the great solubility of acetylene under pressure in alcohol or acetone, the only liquids mentioned in the patent in suit, and of the alleged discovery of the safety of acetylene under pressure when so dissolved, it is evident that these facts were already well known and hence not patentable at the time Claude & Hess made application for the patent in suit. This being the case, there remains the only other feature of the alleged invention of this patent, No. 664,383, the pressure reducing and controlling device. It has already been shown above, by reference to the brief of the attorneys on the appeal to the Board of Examiners-in-Chief in their application for a Method patent that Claude & Hess after disclaiming any discovery on their part of any new properties of acetylene, based their claim to invention upon this pressure reducing and controlling device. Their statement is so important in this connection that it deserves the emphasis of repetition here, as follows:

"The fact that other things had to be done, that special adaptation and arrangement of apparatus had to be made in one or other form,—or in other words that some form of pressure reducing and controlling device must be used between the storage chamber and the point of use, shows that others had stopped short of the discovery or invention here involved."

A comparison of the claims offered in the abandoned application of Claude & Hess for a Method patent (and especially those that were urged in the appeal) with claim 1 of the apparatus patent in suit, No. 664,383, shows that the only differentiation lies in the reducing-valve, referred to in claim 1 of the patent in suit as "means for controlling said inlet whereby the gas may escape therethrough at substantially uniform pressure." In this connection it is significant to

note that when it developed the prior art would shut out applicants from securing a method or process patent unless the reducing valve of the apparatus application could be connected with the claims for the method, the attorneys for Claude & Hess in their brief for the Commissioner of Patents on the final appeal, made the following statement:

"It is proper to say, however, that in our judgment the illustration contained in the apparatus case or a portion thereof, should be introduced in this," adding further on, "the reducing valve," of the apparatus application, "is contemplated in this." In other words, when forced to recognize that the prior art showed there was
119 no invention in producing a supersaturated solution of acetylene in a solvent and permitting the gas to escape from the liquid, an attempt was made, as a last resort, to secure an allowance for the Method application by introducing into it the important feature of the apparatus application with the intention of giving the Method claims sufficient inventive novelty to be allowed and yet not make the intruded matter appear too obtrusively out of place. It was, therefore, urged, so to speak that while reading the specification and claims of the Method application, one should have in the mind's eye a picture of the reducing valve of the apparatus application, as that "is contemplated in this." Such a mere picturing did not, however, supply a sufficiently substantial introduction of the reducing valve into the Method claims to satisfy the Commissioner of Patents, or furnish the limitation needed to give inventive novelty. Furthermore, as the Examiners-in-Chief stated:

"If there were any novelty in using a pressure regulator to permit a gas under pressure to flow at a uniform rate to its place of use, these claims might have some standing. But such devices are common in the arts, so common that one whole class of patents is devoted to them."

Defeated thus in all their efforts to overcome the objection of the Patent Office, that there was no patentable novelty in their alleged invention, and apparently despairing of being able to introduce the limitation necessary to secure an allowance for their method application, Claude & Hess abandoned said Method application by failing to appeal from the decision of the Commissioner of Patents to the Court of Appeals of the District of Columbia.

On the other hand, in the apparatus application, the reducing valve, and its location (as well as that of the gas outlet which it controls) "at a point above the solvent", were made the principal features, and supplied sufficient limitation to secure the allowance of said apparatus application and the issue of the patent in suit.

Having in mind the remarkable manner in which Claude & Hess tried to work into the claims of their Method application some "contemplation" of the reducing valve of their Apparatus application, it is interesting to observe how they have intruded into claim 1 of their Apparatus application (carried to issue as the patent in suit) a suggestion of the process which was the subject of their process or method application. The phrase "produced by forcing acetylene

into a solvent under pressure" is clearly descriptive of a
120 process and not of an apparatus, structure, or device, and, therefore, has no right, value, or meaning in a claim of the apparatus patent. The introduction of such a phrase into claim 1 of the patent in suit would seem to have been with the intention of securing some covert advantage for the unpatentable apparatus of claim 1 of the patent in suit, from having a feature of said process placed where it might be erroneously considered as an element of the combination in claim 1. But whatever may have been the object and intention of Claude & Hess in loading claim 1 of the patent in suit with such an irrelevant phrase, it is perfectly obvious now that the words "produced by forcing acetylene into a solvent under pressure" can serve no useful purpose for anything properly claimed in claim 1, or in any way in the interest of the patent in suit, but they are obtrusively out of place in said claim, tending only to cast suspicion upon the claim as a whole. An unpatentable apparatus (as that of claim 1 of the patent in suit) can not be rendered patentable by suggesting its utility for use in the practice of part of an unpatentable process.

It has already been shown that the reducing valve has long been common in the arts as a means for controlling outlets whereby the gas may escape therethrough at substantially uniform pressure. Reference to the prior art shows also that such means were in use many years before the filing of the application for the patent in suit in connection with apparatus for storing and distributing gas for lighting, in some cases almost identical with the apparatus of the patent in suit. The following patents show that everything connected with the apparatus of the patent in suit was known long before the filing of the application for said patent in suit leaving no opportunity for mere mechanical skill in the alleged invention of the patent in suit.

German Patent to Webb.

The German patent to Webb, No. 58,927, published September 21, 1891, shows a closed vessel for storing gas under pressure, having an outlet for the gas, an automatic reducing and pressure equalizing valve, serving in every respect as "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" to be delivered to burners. As an apparatus for storing and distributing gas this Webb device is a full disclosure of the construction called for in claims 1, 2, and 5, of the patent in suit, and could be used in exactly the same way as that of the patent in suit.

The closed vessel is adapted to hold a solvent charged with
121 acetylene under pressure in place of the compressed illuminating gas, and the porous material, used in the carbureter as an absorbent for the liquid hydrocarbon, could as well be used in the closed vessel to hold absorbed the gas-charged solvent. Used in this way this Webb device would differ in no material way from the apparatus of the patent.

The Dixon Patent.

The Dixon patent, No. 567,764, dated September 15, 1896, also shows a structure approximating very closely to that of the patent in suit, there being a tank or gas holder having within it an automatic pressure regulating and equalizing valve to control the escape of the gas at substantially uniform pressure. From the specification it appears that this gas tank for storing and distributing gas is for use in lighting railway cars and "the gas to be utilized is stored under pressure until required for use," and further it is stated:

"In systems of this description it is necessary to reduce the high pressure gas to a pressure low enough to render it available, in the usual burners, for example. This reduction of pressure is usually accomplished by what is known in the art as a 'regulator'."

The Saunders and Patten Patent.

The Saunders & Patten patent, No. 394,018, dated December 4, 1888, may be referred to, since it was cited by the United States Patent Office against the application for the Claude & Hess patent in suit, and because it shows a reducing valve, referred to in the specification as "an automatic pressure regulator valve C," and this is intended to control the outlet of gas from a storage reservoir, and thus regulate the supply of gas for heating and lighting railway cars.

The Hill Patent.

The Hill patent, No. 261,607, dated July 25, 1882, is another patent showing a reducing-valve, used "to govern varying pressures," in order to deliver compressed air at a substantially uniform pressure independent of the varying pressure in the reservoir.

The Schulke Patent.

Still another patent, that to Schulke, No. 577,939, dated March 2, 1897, shows the use of an automatic pressure regulating valve to regulate the flow of heavy hydrocarbons under high pressure
122 in a lamp reservoir to a pressure sufficiently reduced for use at the burner. This is one of the patents cited by the United States Patent Office against the application for the Claude & Hess patent in suit.

The British Patent to Abel.

The British patent to Abel, No. 9901, dated July 14, 1887, also shows the use of a reducing valve to regulate the pressure of gas from a supply reservoir to the burners in the lighting of railway carriages. This patent was cited by the United States Patent Office against the application for the Claude & Hess patent in suit.

The British Patent to Gearing.

Another British patent, cited by the United States Patent Office, against the application for the Claude & Hess patent in suit, is that

to Gearing, No. 22,183, of 1894, which shows the use of a reducing valve of the typical construction, and referred to in the specification as "the reducing valve *i*." This reducing valve is used to control and equalize the pressure of acetylene gas, developed from calcium carbide under high pressure, as it flows from the outlet of the generator tank to the burners.

The Milwaukee Case.

Judge Quarles, in his decision in the case of The Commercial Acetylene Company vs. Avery Portable Lighting Company, at Milwaukee, used the following language:

"There is one feature of the Claude & Hess discovery which is of paramount importance, namely, the peculiar affinity of acetone for acetylene, and especially the modifying influence of each upon the other when confined in a supersaturated solution."

Again he says:

"Claude & Hess were the first to make known these peculiar and wonderful properties which they must have discovered by actual experiment. This fact is attested by the literature of the art and by the testimony here adduced."

He adds:

"In concluding the discussion on the question of patentability, we may state concisely what Claude and Hess have accomplished by their discovery. First: By equipping the gas package with
123 acetone, they have enormously increased the storing capacity of the tank, rendering it possible to store under moderate pressure 300 times as much acetylene gas as could otherwise be compressed therein. Second: They have disclosed the chemical changes that take place in both gas and liquid when so combined, which render both innocuous and capable of safe transportation."

The record of this Milwaukee case shows that the prior art was very imperfectly presented to the court, nothing indeed in the way of prior patents or publications tending to anticipate or limit the Claude and Hess patent being offered in evidence. The only patents offered were those offered in connection with the Fouché patent, No. 727,609. Not even the patents cited by the United States Patent Office against the application for the Claude and Hess patent in suit were offered in evidence. In view of this it is not remarkable that Judge Quarles should have been so misled as to make the statements quoted above from his decision. With such a review of the prior art before the court as that given above in this affidavit, such language could not have been used, and the decision of the learned judge would certainly have been different in regard to the validity and scope of claims 1, 2, and 5 of the patent in suit. It would have been evident that neither the great solubility of acetylene in acetone nor the "innocuous" character of the "gas and liquid so combined" were disclosed by Claude and Hess. It would have — evident, also, that Claude and Hess on their own statements never made claim in the patent in suit to any such discoveries, and, therefore, were not entitled to any patent based upon such supposed discoveries. Furthermore, with the prior art properly before Judge Quarles he could

not have been misled, as he was, in holding that a hand-operated ordinary needle-valve is the equivalent of a reducing-valve as means for controlling the outlet whereby the gas may escape at substantially uniform pressure, for the purposes for which the Claude and Hess patent in suit is adapted.

Since nothing from the prior art was offered in evidence in the Milwaukee case, tending to show anticipation of the Claude and Hess patent in suit, and as a large amount of such evidence is offered in the case at bar, showing the so-called discoveries upon which Judge Quarles based his decision had all been anticipated, it must be obvious that that decision can have no bearing in this case, except to show how absolutely defective was the evidence placed before the Court by Defendant's attorneys, and the extent to which Judge Quarles was misled by it. The evidence now offered in the case at bar clearly shows anticipation, in the prior art, of the
124 Claude and Hess patent in suit, and that conditions in the two cases are very different. Indeed so different are they that in the Milwaukee case Judge Quarles stated:

"There is one feature of the Claude and Hess discovery which is of paramount importance, namely, the peculiar affinity of acetone for acetylene and especially the modifying influence of each upon the other when combined in a supersaturated solution," while in the case at bar defendant has no use for acetone and does not use acetone in any way whatever, but does use a new and entirely different solvent, named Terpeline, which, as already shown, is superior to acetone as a solvent for storing and distributing acetylene gas.

The British Patent to Claude and Hess No. 29,750 of June 30, 1896.

The British patent to Claude and Hess, dated June 30, 1896, was granted for a term of fourteen years, and hence said patent expired June 30, 1910. If it can be shown that this British patent, No. 29,750, is for the same alleged invention as that of the patent in suit it follows, in accordance with the provisions of Section 4887, Rev. Stat. U. S., that said patent in suit expired on the same date, June 30, 1910.

The following description taken from the specification of the Claude and Hess British patent, No. 29,750, gives the essential features of the alleged invention:

"This invention relates to an improved method of storing acetylene for lighting and other purposes, in a small volume in order that it may be supplied in portable form to the consumer, and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene to be stored in a small volume in readiness to be supplied for any purpose for which it may be required. * * * For these reasons we avail ourselves of the great solubility of acetylene in certain liquids and increase this solubility by pressure, and this method of storing acetylene gas is the invention which we hereby broadly claim as our invention, whatever may be the liquid employed, the kind of apparatus, or mode of operation. * * * When gas is withdrawn

from a receiver containing a solution of acetylene under pressure, the pressure necessarily falls constantly, and to obtain a regular supply of gas we provide the vessel with a pressure regulator. * * * The receiver has a cock and the necessary adjuncts for connection directly or through an expansion chamber with the appli-
125 ances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected".

Although the title of this Claude and Hess British patent, No. 29,750, is "An Improved Method of Storing Acetylene for Lighting and Other Purposes", while the Claude & Hess patent in suit is for "Apparatus for Storing and Distributing Acetylene Gas", it will be noted that in the description of the alleged invention, quoted above from the specification of the British patent, No. 29,750, there is described the apparatus of the patent in suit. There is the "receiver" for the acetylene dissolved in a solvent under pressure, that is, the "supersaturated solution" of the patent in suit. The "receiver", also, has its "expansion chamber", forming an upper compartment, and there is the "pressure regulator", the "reducing-valve", as means for controlling the outlet "to obtain a regular supply of gas", that is, a substantially uniform flow, notwithstanding that as the gas separates from the solution, on the supply side, "the pressure necessarily falls constantly". So here we have all the essential features of the apparatus of the patent in suit and its operation described in the specification of the British patent, No. 29,750. Furthermore, claim 6 of said British patent, No. 29,750, claims the apparatus, "as specified" in the specification, as given above. This claim 6 is as follows:

"The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified."

The alleged invention of the patent in suit is thus seen to be that described in the specification, and claimed in claim 6 of the British patent, No. 29,750. If the alleged invention of these two patents respectively are not the same, wherein is the differentiation? It is observable only in the titles, that of the British patent No. 29,750, being for a "Method" and that of the patent in suit being for "Apparatus"—a difference that is merely nominal and quite immaterial, and it is obvious that in the operation of a method some apparatus will be required.

The certified copy of the British patent to Claude and Hess, No. 29,750 (Defendant's Exhibit No. 25) and the certificates attached thereto show that said patent is dated June 30, 1896, making under the British law the date of expiration June 30, 1910, also that owing to failure to pay the required renewal fee, which became due June 30, 1900, the said British patent to Claude & Hess, No. 29,750, expired on the latter date. It is observed that this date, June 30,
126 1900, on which said patent lapsed through failure to pay the prescribed fee, was nearly six months before the issue of the United States patent in suit, No. 664,383.

The French Patent Granted to Claude & Hess, No. 257,679, Dated June 30, 1896, and Certificates of Addition Thereto, Dated June 11, 1897, and April 26, 1898.

Certified copies of the French patent to Claude & Hess, No. 257,679, and of two certificates of addition thereto, are offered in evidence, as Defendant's Exhibits 26, 26*a*, and 26*b*, respectively. As French patents are granted for fifteen years, and as the certificates of addition expire at the time the patents expire to which they are additions, the said Claude & Hess French patent with its said two additions expired June 30, 1911.

There are no drawings attached to the French patent but with each of the certificates of addition is a drawing and each of these drawings shows a needle-valve to control the flow of acetylene gas from the receptacle containing the acetylene-charged solvent.

Judge Quarles, in his decision in the Milwaukee case, having been misled, as already shown, by the absurdly imperfect record of the prior art placed before him by defendant, erroneously gave an expanded interpretation to claims 1, 2, and 5 of the Claude & Hess patent No. 664,383, by holding a hand-operated needle-valve to be the equivalent for means for controlling the escape of gas "at substantially uniform pressure". With the expiration of the French patent to Claude & Hess, No. 257,679, and its additions thereto, on June 30, 1911, there expired therefore Judge Quarles's needle-valve expanded interpretation of claims 1, 2, and 5 of the Claude & Hess patent in suit, No. 664,383.

The German Patent No. 97,953, to Claude & Hess, August 27, 1896.

As shown by the certified copy of the German patent granted to Claude & Hess (Defendant's Exhibit No. 28), the term of the grant under the German law is fifteen years, and as the date of this patent No. 97,953, is August 27, 1896, said patent will expire at the end of the day, August 26, 1911. This is important, since, as
127 will be shown, the substance of the invention described in the German patent to Claude & Hess, No. 97,953, is the same as that described in their United States patent in suit, No. 664,383, and in addition the claim of the German patent corresponds exactly to claims 1, 2, and 5 of the United States patent as to items and substance, though differing in phraseology.

The following taken from the specification of the German patent, No. 97,953, describes the invention of the patent:

"According to the present invention, by simple compression a great reduction in volume can be obtained without the necessity of employing such high pressure as is required to liquefy the gas. Acetylene is taken up by certain liquids, and in greater quantity the higher the pressure under which the acetylene and the liquid are put. The gas is, accordingly, brought under pressure into intimate contact with the liquid which is to absorb the same (assisted by increases in pressure, agitation, cooling, etc.) whereby it is absorbed by the liquid to the greatest possible extent. The saturated liquid is then placed in receptacles of suitable strength."

After enumerating liquids especially suited for the absorption of acetylene, among which are mentioned alcohol and acetone, the specification stated:

"The receptacles for the saturated liquid are provided with a cock or valve, through which the gas can be withdrawn for use, according to the reduction in pressure. * * * Since the pressure of the gas during its escape from the absorbent liquid diminishes, a pressure reducer or regulator of any desired construction is made use of where a constant pressure is required. Accordingly, the great capacity of certain liquids for absorbing acetylene is made use of for storing acetylene in large quantities in small volume, the said capacity increasing considerably with the pressure. This enables the use of light, portable receptacles, filled with liquid and capable of being used over and over again * * * Another new result is based on the fact that the solution of acetylene in a liquid considerably reduces its explosibility. * * * The absorption of acetylene can be performed by any process in use for similar purposes, for example, by one of the processes used in the production of artificial seltzer water. * * * In case it is necessary to take the gas from the bottles at a constant pressure, there is inserted, as above stated, a pressure regulator, or the acetylene may be led to a gasometer, or one of the well-known pressure reducers is placed over the outlet." * * * "What is claimed is: The employment
128 of liquids charged with acetylene under pressure to furnish acetylene for lighting purposes, power, heating, etc., characterized by the fact that the acetylene under pressure is absorbed by a suitable liquid and the latter is stored in suitable receptacles, from which the gas, in some cases through a pressure regulator, is taken to the place of use."

It is obvious that the alleged invention described and claimed in this German patent to Claude & Hess, No. 97,953, is identical with that of the United States patent to Claude & Hess, No. 664,383, the patent in suit. In each there is a "suitable receptacle" for storing the "liquids charged with acetylene under pressure," the "supersaturated solution" of acetylene, from which the gas is made to pass through a "pressure regulator," the "reducing-valve," as means for controlling the outlet; "whereby the gas may escape at uniform pressure," since the pressure of the gas during its escape from the absorbent liquid diminishes." There can be no question as to the complete identity of the subject matter of these two patents, the German patent, No. 97,953, and the patent in suit, No. 664,383, therefore, the patent in suit, even if it should fail of having already expired at the same time with the British patent, No. 29,750, through lack of sufficiently close identity with the subject matter of the patent in suit, and the subject matter of the said British patent (a condition that would seem most improbable and wellnigh impossible), then absolutely, and without doubt, the patent in suit must expire at the close of August 26, 1911, on account of the absolute identity between the subject matter of the patent in suit and that of the German patent to Claude & Hess, No. 97,953, the legal term of which latter patent expires at that time.

(Signed) WILLIAM B. POTTER.

Subscribed and sworn to before me this 18th day of August, A. D. 1911.

My commission expires the eighth day of May, A. D. 1915.

[SEAL.] GLADYS WALTON,
Notary Public within and for the City of St. Louis, Missouri.

129 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK AND ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
District of Columbia, City of Washington, ss:

Royce A. Ruess, being duly sworn, on his oath, deposes and says, as follows:

I am thirty-one years of age, and a resident of Washington, D. C., my occupation being that of patent counsellor and solicitor and expert in patent causes. I have testified as expert in a number of suits involving United States letters patent in the United States Circuit Courts, and have been for upwards of twelve years engaged in the study, examination, and comparison of patents devoted to mechanical subjects, and have been recognized as having special skill, in an analytical capacity, in discerning fine lines of distinction between devices of similar construction and use for the purpose of demarking possible patentable distinction on which to base a claim or claims which will patentably define a known structure from alleged anticipations during the prosecutions of applications for patent. I have been consulted by a number of patent attorneys with respect to claims in patent applications, and have prepared and prosecuted hundreds of applications for patent and have critically examined and analyzed thousands of patents. My practice brings me in constant contact with the Patent Office Examiners, and I have been consequently familiarized with their line of thought and rules of judgment in determining the line of distinction between invention and mechanical skill and the lack of invention. On the one hand my experience obtained during the prosecution of patent applica-
130 tions has trained my mind to the observance of distinctions and differences which a patent application may present over the prior art as cited by the Primary Examiner. On the other hand, I have investigated the validity and scope of a large number of patents, involving substantially all of the arts, and have rendered opinions in such cases, which has consequently trained my mind to the observance of resemblances and similarity between mechanical

devices in order to properly determine whether a prior patent or publication anticipates the claim or claims of a patent later issued. I pursued a course in the Technical High School of Washington, D. C., involving mechanical drafting and actual practice in wood working, forging, and general machine shop practice embodying the physical construction of mechanical devices of various types.

I fully understand the Claude & Hess patent, No. 664,383, dated December 25, 1900, having read same and the files in the Patent Office appertaining thereto. I also fully understand the patents and publications referred to by the Patent Office during the course of the application for said Claude & Hess patent, No. 664,383, and am familiar with other prior patents and publications bearing on same.

The Patent in Suit.

The Claude & Hess patent discloses an apparatus for the storage and distribution of acetylene gas, consisting of a tank divided into two compartments, the divisional wall d^3 separating them. A reducing-valve d automatically controls the escape of gas from the lower compartment, and thereby regulates the pressure of the gas in the upper compartment, the escape from which is controlled by an ordinary valve c^3. The theory of the Claude & Hess patent is that such tanks shall be charged at a central station and shipped to some place where they can be connected with the pipes and burners of a building, room, or the like, to be either heated or lighted. Nothing in the patent indicates that Claude & Hess contemplated the use of this appaatus as a means for illuminating the headlights of automobiles or other vehicles, and certainly such use is not suggested by the Claude & Hess patent and is one very remote from that which the specification of that patent does contemplate. The patent shows its purport furthermore by distinguishing between the use of the apparatus of Figure 1 and that of Figure 2, by suggesting the use of the former for lighting one room and the use of the latter for illuminating an entire building, lines 21-24, page 2, of
131 the patent setting forth the following: "When the gas-storing apparatus is to be connected with supply-pipes for distribution throughout a building, it is desirable to duplicate the apparatus, as shown in Figure 2." The Claude & Hess patent says that the lower compartment in the tank a "shall contain a fluid b, such as alcohol or acetone, capable of dissolving acetylene gas", and that the upper chamber shall contain acetylene gas that has escaped out of the fluid b, such emission being regulated by the reducing-valve d.

The Claude & Hess patent (line 27, page 1) requires that the gas outlet for the gas emitted by the solvent b shall be "so positioned as to be normally above the level of said solution". Obviously, Claude & Hess regarded the location of the outlet for the gas "at a point above the solvent" as one of the necessary elements of their apparatus, because the language of their patent (line 27, page 1) explicitly so states, and it is with good reason that this language was used in their specification. So high an authority

as the "Scientific American" says in its issue of May 6, 1911 (Volume CIV, page 453): "In all cases where acetone is used, the valve must be kept at the top to prevent its escape." This is why the "Prest-O-Lite" tanks are marked on one side of their circumference adjacent to the needle valve by which they are closed, "This side up." If said outlet for the gas is located lower than the level of the supersaturated solution of acetone and acetylene gas, the gas, when emitted, will carry the liquid with it. This loss of solvent is objectionable for various reasons, among which may be mentioned the waste of it and, also, the fact that, as each volume of acetone holds many times its own volume of acetylene gas, the danger of explosion of the freed acetylene gas is increased by the too rapid diminution of the store of acetone. Besides this, when acetone is carried out of the tank with the gas, its combustion produces a deposit of carbon on the burner-tips. This deposit of carbon results in the burners becoming clogged, and a full flame can not be obtained from such burners until such carbon deposit has been removed.

It is significant to note that in the Claude & Hess patent the term *"reducing-valve"* is so often mentioned, and there can be no question as to what Claude & Hess intended to cover by such term as distinguished from an ordinary valve, as appears from the following matter (line 50 *et seq.*, page 1 of the patent, italics mine):

"It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the at-
132 mospheric pressure, *and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve* being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use."

The keynote of the Claude & Hess patent is struck by the matter just quoted and by other references to a reducing-valve as means for controlling the outlet of the gas from the chamber containing the solvent *b*, whereby the gas may escape therethrough at substantially uniform pressure.

It is manifest that Claude & Hess deemed essential some automatic means for controlling the escape of the gas, for the purpose of securing substantially uniform pressure at the burners. Any means that would accomplish that purpose would be a reducing-valve. That kind of valve has been very well known for many years in various arts, and, therefore, Claude & Hess in their patent simply described and showed a reducing-valve of ordinary construction for allowing the escape of the gas through the burners at substantially uniform pressure, which pressure the patent states (page 2, lines 13-20), shall be "substantially the same when the receptacle is fully charged as when it is nearly exhausted", that form of regulation of the gas pressure being procurable only by means of the reducing-valve mentioned in the same sentence.

From the above, I think it correct to say that the alleged inven-

tion of said Claude & Hess patent resides in the following: A vertically-arranged tank divided into two compartments with a divisional wall d^3 between them, the lower one containing a liquid, such as alcohol or acetone, which acts as a solvent for the gas held therein in solution, while the upper compartment holds a smaller quantity of gas that has escaped from the solvent and which possesses a pressure suitable for delivery at the burners, being delivered at said burners at said proper burner pressure, by reason of the interposition of the reducing-valve d between said two compartments. The gas is introduced into the solvent b by pipe a^2, which discharges the gas at the bottom of the compartment that contains solvent b. The patent describes the escape of the gas to and through the burners in the following language (beginning at line 92, page 1): "In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure (the pressure of the gas within the receiver of course decreasing
133 as the gas passes out therefrom), a reducing-valve d of any suitable or usual construction is interposed between the interior of the receptacle and the outlet c therefrom. As herein shown, the said reducing-valve is in a passage d^2 connecting the spaces below and above a wall or partition d^3 near the upper portion of the receptacle a, the dissolved acetylene being contained in that portion of the receptacle which is below the said partition, the portion above being normally empty and forming a reservoir for the gas at low pressure which has passed into said reservoir through the said reducing-valve. In order that the reducing-valve d may be set or adjusted to respond to any desired pressure, the vessel a is shown as provided with a removable plug d^4, through which access may be had to the adjusting-stem d^5 of said valve. It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted".

This makes it plain that Claude & Hess intended that automatic means located between the chamber containing the solvent b saturated with acetylene under pressure and a mere valve c^3 should control the pressure of the gas as delivered at the valve c^3, so as to be "substantially uniform" and "only slightly above the atmospheric pressure", such pressure being further qualified by "being substantially the same when the receptacle is fully charged as when it is nearly exhausted".

Obviously, the claims can not be broader than the disclosure of the specification and drawings, being to the contrary, limited in exact accordance with said disclosure.

The term "reducing-valve" necessarily implies an automatic device, that is to say, the device if not automatic will fail to control the outlet so that the pressure on the discharge side will be uniform regardless of what the pressure on the supply side may be, otherwise the term "reducing-valve" surrenders its significance.

That the Claude & Hess patent is limited to a reducing-valve as

distinguished from an ordinary valve, such as a water faucet, is apparent from the following language appearing on page 2, lines 13-20:

"It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

134 The Claims of the Claude & Hess Patent.

The claims of the Claude & Hess patent, No. 664,383. without exception accentuate the fact that, as above stated, their alleged invention resides in the positive inclusion of a "reducing-valve" however styled, which permits discharge of the gas at uniform pressure, as will appear from the following analysis of the claims:

Claim 1.

Claim 1, so far as structure is concerned, includes:

"A closed vessel" "having an outlet," and "means for controlling the outlet," which controlling means is qualified by the language of the claim as being automatic, otherwise so far as structure is concerned, a coffee urn having a faucet to permit discharge of the coffee, will flatly anticipate the claim. The specification of the Claude & Hess patent states: "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." Comparison of this language in the specification with the language of Claim 1 clearly shows the meaning of Claim 1 in the phrase "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure," this element of Claim 1 being thus shown plainly to be the reducing-valve referred to so many times in the specification and therein made the most notable feature of the patent.

The gas in solvent *b* being absorbed therein under strong pressure, it will, if allowed to flow directly out of valve, c^3, do so with steadily decreasing pressure. This is due to the fact that, when a body of gas is held compressed within any confined area, a reduction of quantity of gas necessarily results in diminution of compression of the remainder, that remainder being, therefore, more diffused within that area which formerly held the larger body of compressed gas. The greater the diffusion of the gas within a prescribed area, the less will be the pressure of that gas either within the confining receptacle or at the mouth of that receptacle from which it

makes its escape, as, for instance, to the burners in the patent
135 under consideration. Therefore, if the acetylene gas in the solvent *b* of the Claude & Hess patent be allowed to pass out of the valve c^3 or out of an opening controlled by a mere needle valve, like that which controls the gas outlet in the "Fireball" and "Prest-O-Lite" tanks, and without the interposition between the solvent *b* and the gas outlet c^3 or similar opening of the reducing-valve *d* of the Claude & Hess patent, the force with which the gas escapes through the burners or passes the valve c^3 of the Claude & Hess patent will steadily decrease. At the beginning, the force at which the gas escapes will be strong; it will steadily decrease; and at the end, when the tank is nearly empty of acetylene gas, it will be very weak. This condition arises from the use of a needle valve, such as is found in the "Fireball" and "Prest-O-Lite" tanks, or from the use of the valve c^3 of the Claude & Hess patent without the auxiliary use of the reducing-valve *d* of the Claude & Hess patent, which will result in an operation and mode of gas discharge directly contrary to the essence of the Claude & Hess patent in two respects, namely: (*a*) when the tank is full of acetylene gas, the discharge will not be "only slightly above the atmospheric pressure;" and, more important (*b*), "the pressure" will not be "substantially the same when the receptacle is fully charged as when it is nearly exhausted." It is to procure these two results that the last element of Claim 1 of the Claude & Hess patent is prescribed by that claim, and, as these results can not be obtained by the use of a needle valve, such as is found in the "Fireball" and "Prest-O-Lite" tanks, or by the use of any other kind of valve than a reducing-valve, such as the reducing-valve *d* of the Claude & Hess patent, Claim 1 of the Claude & Hess patent must be understood, and can only be understood, as requiring as its final element, expressed in the phrase "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure," the presence of a reducing-valve in any structure supposed to be patented by or to come within the scope of Claim 1 of the Claude & Hess patent.

Claim 2.

There is great difference between claim 2 and claim 1, due to the fact that claim 2 makes the solvent and acetylene under pressure elements of the combination of the claim. According to the practice of the Patent Office said solvent and the acetylene gas under pressure are not elements of claim 1 because not, according to Patent
Office parlance, positively stated in claim 1. It was hard
136 enough for the Patent Office to grasp the idea of a combination composed of mechanical elements such as the "tight shell or vessel" mentioned in claim 2, the "reducing-valve" mentioned in claim 2, etc., and a liquid element like the solvent and a fugitive element like the acetylene gas; but all these elements are properly combined in claim 2 of the Claude & Hess patent, but in claim 1 of the Claude and Hess patent, the statement of the contents of the "closed vessel" does not make claim 1 a claim for the

combination of the closed vessel, its contents, and a valve, but claim 1 is only for "a closed vessel," "having an outlet," "and means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." The solvent and the acetylene gas are not so mentioned in claim 1 as to constitute part of the combination of that claim, and it is in this respect that I am pointing out that claim 1 differs from claim 2. In claim 1 the solvent and the acetylene gas are mentioned merely as the contents of the "closed vessel," whereas in claim 2 each is directly enumerated as an element of the claim. Claim 1 is, therefore, a claim merely for a bottle with a stopper, unless said claim be understood as limited to a vessel having a reducing-valve to control its outlet, but claim 2 is a proper claim for "a prepared package consisting" of the elements enumerated in claim 2. One of the elements specifically named in claim 2 is a reducing-valve, and it is, therefore, limited thereto. Claim 2 is, also, limited to the positioning of that reducing-valve "at a point above the solvent."

In my description of what is disclosed by the Claude & Hess specification I have fully pointed out the reasons why these limitations are made in the claims of this patent, the reducing-valve being specified in all the claims of the patent because it was the desire of Claude & Hess to allow the escape of the gas at the burners at substantially uniform pressure and at a pressure "only slightly above the atmospheric pressure" and of such degree as to be "substantially the same when the receptacle is fully charged as when it is nearly exhausted," and the other limitation as to the location of the reducing-valve being due to the nature of acetone, which makes it necessary as stated by the "Scientific American," at page 453 of the issue of May 6, 1911, to locate the valve at the top "where acetone is used," in order "to prevent its escape."

Claim 3.

Claim 3 is limited to details such as, for instance, the requirement that the "valved inlet-pipe a^2" shall extend "to a point
137 near the bottom of the chamber a" and to the provision of "a horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2." This claim is, furthermore, limited by the specific requirement of a "reducing-valve d" and to the location thereof in the horizontal diaphragm d^3 and by its demand for a separate "valved outlet-pipe c through which the gas after passing the reducing-valve may escape to the main or distributing pipes."

Claim 4.

Several limitations appear in claim 4: (1) "An inlet-pipe opening into said vessel near the bottom of the chamber;" (2) The "outlet-opening from the solvent-chamber" must be located "above the level of the solvent;" and (3) a "reducing-valve" is to be "applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity."

Claim 5.

Claim 5 is somewhat like claim 2, being limited to "a reducing-valve," but, unlike claim 2, specifically includes "acetone" as the solvent. Claim 5 specifies further that the reducing-valve is located "above the level of the solvent," the reason for such location being above set forth.

Claim 6.

Claim 6 recites a vessel having a chamber, a reducing-valve, the reducing-valve being at "the upper part of said chamber." In addition this claim includes a second valve, shown as c^3 in the Claude & Hess patent, the claim referring to the valve c^3 as "means for temporarily sealing the vessel completely." Obviously claim 6, therefore, explicitly requires the presence of two valves.

Defendants' Tank.

Defendant's tank, shown in the drawing marked Defendant's Exhibit No. 2, which is in accord with United States letters-patent No. 987,000, issued March 14, 1911, owned by defendant, very obviously differs in spirit, principle, function, and structure from the alleged invention described and claimed in the Claude and Hess patent, as will now appear.

I am forced to the conclusion, as regards the infringement by defendant of claim 1 of the Claude and Hess patent, that claim 1 is not infringed by defendants' tank, for the obvious reason that said claim 1 is certain and positive in its inclusion of "a vessel—
138 having an outlet" and "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure."

Defendants' tank is equipped with a needle valve 8, as shown in said patent 987,000, which valve to any one skilled in the art to which valves pertain is obviously incapable of "controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure," which quoted language is on its face a reducing valve, as distinguished from any ordinary valve, such as a water faucet valve. I do not find that defendants' tank infringes claim 1 of the Claude and Hess patent, because the latter is obviously limited to some type of reducing valve, whereas defendants' tank is more like any ordinary keg of beer which has a hand-actuated rotatable valve, than it is like a tank or vessel which has an automatic pressure-reducing valve.

Claim 1. As claim 1 of Claude & Hess is expressly limited to a pressure reducing valve of some type such claim cannot, by any reasonable or permissible interpretation, be distorted to include, for instance, a beer keg valve, or, as defendants' tank shows a needle valve. I am fully justified in considering the final element in claim 1 of Claude and Hess' patent "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" as a pressure reducing valve or regulator in view of lines 56-63, page 1, of the Claude and Hess patent.

Moreover, if the final element of the Claude and Hess patent is considered as not limited to what it specifically states it to be, then a beer keg with a spigot, or a coffee urn with a faucet will precisely anticipate same. Of course the statement of use contained in claim 1, "containing a supersat-ated solution of acetylene produced by forcing acetylene into a solvent under pressure" is of no significance in defining structure, since so far as the latter is concerned the same is not affected by the particular liquid utilized.

Claim 2. This claim specifically includes "a reducing valve", which is obviously a valve which automatically controls the outlet to which it is applied, so that uniformity in pressure is maintained upon the discharge side of the valve, regardless of variation in pressure on the supply side of the valve.

Obviously the following extracts from the specification of Claude and Hess prove that they acknowledged the vital principle and spirit of their invention to be the use of a reducing valve:

139 "It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use" (Page 1, lines 50-63).

"In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure, (the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom), a reducing-valve *d* of any suitable or usual construction is interposed between the interior of the receptacle and the outlet *c* therefrom" (Page 1, lines 92-100).

Defendants' tank shows no valve nor equivalent structure which in any way is automatic, or which reduces the gas pressure mentioned and positively claimed by Claude and Hess.

Claim 2, however, is additionally limited by prescribing that such reducing-valve shall be located "at a point above the solvent" and it is therefore important to add that defendants' valve 8 (which is not a "reducing-valve" nor the equivalent therefor) is not located "at a point above the solvent," but at a point below the level of the solvent, and approximately about the middle of the solvent. As hereinabove pointed out, the specification of the Claude and Hess patent in suit says that it is one of the essentials (line 27, page 1), of the alleged invention of that patent that the "outlet for the gas" shall be "so positioned as to be normally above the level of said solution." So very essential to the practice of their alleged invention did the patentees, Claude and Hess, regard the locating of the outlet for the gas at a point normally above the level of the solvent that that limitation to the location of the outlet for the gas, namely, above the solvent, is found in claims 2, 3, 4, 5, and 6.

Claude and Hess mention but two gas solvents in their specification, namely acetone or alcohol, but defendant uses a solvent called

by the name "Terpeline," which, I am informed, due to its constituency, does not "blow" with the gas, and thus makes it possible to locate the needle valve in defendants' tank (Defendant's Exhibit No. 2) at a point below the level of the solvent, as distinguished from the location of a reducing-valve above the level of the
140 solvent as shown in the Claude and Hess patent and specifically required by claims 2, 3, 4, 5 and 6 of the same. In view of the fact that in the Claude and Hess patent either of the two solvents, i. e., acetone or alcohol, will "blow" if the gas outlet is located below the solvent level, the limitation contained in claims 2, 3, 4, 5 and 6 which requires that the reducing valve be located above the solvent becomes essential and of importance.

I therefore find that defendants' tank does not infringe claim 2 of the Claude and Hess patent for the reason that defendant's tank is not provided with a reducing-valve, or the equivalent therefor, and further is not provided with a valve or a gas outlet of any kind at a point above the solvent.

Claim 3. Defendant's gas tank is not constructed in accordance with claim 3, and differs therefrom in a number of respects, and therefore, is not an infringement thereof. In the first place, defendant's tank is not an "apparatus for storing gas and delivering it at a substantially uniform rate." In the second place, defendant's tank is not provided with "a valved inlet-pipe a^2," and is, therefore, unprovided with such a pipe extending to a point near the bottom of the chamber a." Defendant's tank also omits the "horizontal diaphragm d^3, and, therefore, has not such diaphragm in the "upper portion" of the chamber a. Moreover, defendant's tank possesses no reducing-valve or an equivalent therefor.

Claim 4. Defendant's tank differs widely from the apparatus claimed by claim 4 and is outside of its scope and, therefore, not an infringement thereof. For instance: Defendant's tank possesses no "inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent." Nor has it "an outlet-opening from the solvent-chamber above the level of the solvent." This claim calls for two chambers, while defendant's tank has but one. Furthermore, the claim demands "a reducing-valve" "serving to permit escape of the gas in regulated and uniform quantity." Defendant's tank has no reducing-valve and no other or equivalent means "serving to permit escape of the gas in regulated and uniform quantity."

Claim 5. This claim is limited to the use of acetone as the solvent, whereas defendant does not use acetone but "Terpeline." If defendant used alcohol as the solvent, instead of acetone, it would be outside the scope of this claim 5, notwithstanding that in the Claude and Hess patent alcohol is mentioned as an alternative for acetone. Since, however, defendant uses an entirely different solvent, and further fails to employ a reducing-valve or its equivalent, nor locates the gas outlet above the level of the solvent, it is very obvious that defendant does not infringe claim 5.

141 Claim 6. Claim 6 is restricted to a vessel having two chambers, the lower one receiving a gas solvent. Defendant's tank has but one chamber, and the tank is not provided with "an outlet

for the gas in the upper part of said chamber." It is noted in this connection that in defendant's tank the gas outlet is located at a point on the side of the tank, or rather at one end hereof, between the top and bottom, and not at the upper part of its one chamber. Claim 6 further requires the presence of a reducing-valve and a second valve which is mentioned in the claim as "means for temporarily sealing the vessel completely." Defendant's tank possesses but one chamber and embodies but one valve, which latter is not a reducing-valve nor an equivalent therefor. I therefore find that there is no infringement of this claim by defendant's manufacture.

In conclusion, I find that defendant's tank is not double-chambered; it employs no reducing valve or its equivalent; the gas outlet is not located above the level of the solvent; nor does the tank contain acetone or alcohol as a gas solvent, in one or more of which respects all six claims of the Claude and Hess patent are limited. The patent in suit mentions only two solvents, namely, alcohol and acetone, and since defendant uses a solvent different, and in fact better than either alcohol or acetone, the term "solvent" in claims 1, 2, 4 and 6 should be understood as referring to either alcohol or acetone, which are the only two solvents that Claude and Hess mention.

The Prior Art.

The term "solvent" is used in claims 1, 2, 4 and 6 in a broad way, without reference to the exact nature of the solvent whether alcohol or acetone, while claim 3 refers to a "solution of gas." Claim 5 specifically recites acetone, and with the exception of the latter the remaining claims leave it open to either the use of alcohol or acetone. Anticipation may, therefore, be shown by either alcohol or acetone or any other solvent, such as acetic acid or chloroform or turpentine or benzine or carbon disulphide or carbon perchloride or water.

Henry's Law.

Gases can be dissolved in liquids, water for instance. In 1803 an English chemist named William Henry made the further discovery that the quantity of gas that any liquid will dissolve depends upon the amount of pressure to which the gas is subjected, the principle being commonly known as "Henry's Law."

142 The Americanized Encyclopedia Britannica revised and amended, published in Chicago, in 1890, by Belford-Clarke Company, in its article on Henry, contains the following on pages 3105-3106, Vol. V:

"In 1803 he published his elaborate experiments on the quantity of gases absorbed by water at different temperatures and under different pressures, with the result of establishing the law that 'water takes up of gas, condensed by one, two, or more additional atmospheres, a quantity which would be equal to twice, thrice, etc., the volume absorbed under common pressure of the atmosphere.'"

The Discovery of Acetylene Gas.

Acetylene gas was first discovered in 1836 by Edmund Davy, an Englishman, and at that time was known as "Bicarburet of Hydrogen," and the Report of the Sixth Meeting of the British Association, in 1836 (Published in London in 1837, Vol. 5, Part 2, Sixth Report, Pages 62-63) announced the discovery in an article entitled "Notice of a new Gaseous Bicarburet of Hydrogen" in which article is found the following:

"The new gas * * * is slowly absorbed by water."

"The new gas is absorbed to a certain extent by, and blackens, sulphuric acid."

A certified copy of the part of the foregoing publication referred to will be filed herewith, marked "Defendant's Exhibit No. 29."

Davy's "Guide to Chemists."

Published in London, in 1836, Page 23.

The following appears on page 23 of Davy's "Guide to Chemists," published in London in 1836:

"Fill a jar or tube with ammoniacal gas and immerse its mouth in water. The water will absorb the gas rising into the jar and would fill it completely if the gas were pure. Such gases as are absorbed by water cannot be collected over the pneumatic trough, but require the aid of the mercurial trough."

Watt's Dictionary of Chemistry.

Published in 1875, Volume 2, Page 791.

In the edition of Watt's Dictionary of Chemistry published in 1875, Vol. 2, at page 791, is found the following:

"The amount of gas absorbed by a liquid on which it exerts
143 no chemical action is dependent (1) on the specific nature of the gas and of the liquid; (2) on the temperature at which the absorption takes place; and (3) on the pressure under which the absorption takes place."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendant's Exhibit No. 12."

Wurtz's Dictionary of Chemistry.

Published in 1875, Volume 1, Part 1, Page 43.

In this work, published as above stated, a copy of which has been in the Scientific Library of the United States Patent Office since October 17, 1891, is found, at page 43, Vol. 1, Part 1, the following:

"Solubility of Acetylene: Water, carbon disulphide, and amyl hydrid dissolve about their volume of acetylene gas; illuminating petroleum 1½ times its volume; essence of turpentine and carbon perchloride, twice their volume; chloroform and benzine, 4 times their volume; crystallizable acetic acid and absolute alcohol, about

6 times their volume. (Berthelot, Ann. de Chim. et de Phys. (4), Vol. IX, p. 424)."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendant's Exhibit No. 13."

Treatise on Beverages, by Sulz.

Published in 1888, Page 119.

In the Treatise on Beverages, by Charles Herman Sulz, published in New York in 1888, a copy of which has been in the Scientific Library of the United States Patent Office since July 7, 1891, is found, at page 119, the following:

"We have already mentioned that water absorbs a greater amount of carbonic acid gas with increased pressure. It is found by experiment that this amount increases in proportion to the pressure as follows: At the pressure of one atmosphere (14.7 lbs.) the water will absorb its own volume; at the pressure of the two atmospheres, twice its own volume; at three atmospheres, three times its own volume, and so on, until at about 540 lbs. to the square inch the carbonic acid gas itself becomes a liquid, as was discovered by Faraday in 1823."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith marked "Defendant's Exhibit No. 14."

144 Treatise on Beverages, by Sulz.

Published in 1888, Page 123.

In the Treatise on Beverages, by Charles Herman Sulz, published in New York in 1888, a copy of which has been in the Scientific Library of the United States Patent Office since July 7, 1891, is found, at page 123, the following:

"As soon as the pressure in the cylinder gets diminished by letting escape its surface gaseous contents, a certain amount of the gas already absorbed by the liquid is eliminated in consequence of the decreased pressure."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendant's Exhibit No. 15."

Roscoe and Schorlemmer's "Treatise on Chemistry."

Published in 1891, Pages 135 and 141.

In the standard "Treatise on Chemistry," by Roscoe and Schorlemmer, published in New York, in 1891, a copy of which work has been in the scientific library of the United States Patent Office since December 6, 1892, is found the following:

Page 135.

"57. Manufacture of Hydrochloric Acid.—This acid is obtained on the large scale as a by-product in the manufacture of soda-ash. In the alkali works 10 cwt. of salt is introduced into a large hemispherical iron pan, 9 feet in diameter, heated by a fireplace underneath, and covered by a brickwork dome; upon this mass of salt the requisite quantity (10 cwt.) of sulphuric acid (sp. gr. 1.7) is allowed to run from a leaden cistern placed above the decomposing pan. Torrents of hydrochloric acid gas are evolved, which collect in the space between the pan and the brickwork dome, whence they pass by a brickwork or earthenware flue into upright towers or condensers, built of bricks soaked in tar, or of Yorkshire flags fitted and clamped together. These towers, shown in vertical section in Fig. 34, and in ground plan in Figure 35, are filled with bricks or coke, down which a small stream of water from a reservoir at the top of the tower is allowed to trickle. The gas, passing upwards, as shown in the figures by the arrow, meets the water and is dissolved by it; and as the acid-liquor approaches the bottom of the tower it becomes more and more nearly saturated with the gas."

145

Page 441.

"258. Two processes are now used, viz., (1) measurement of the volumes of the component gases, (2) determination of their weight. The first of these processes, or the eudiometric method, has been practiced by Regnault, Bunsen, Lewy, and Angus Smith, whilst the latter method has chiefly been used by Dumas and Boussingault in their celebrated research carried out in the year 1841. In their analysis of air by the latter method, the two French chemists employed an apparatus shown in Fig. 142. The large balloon (V) was rendered as perfectly vacuous as possible, and brought in connection with the vacuous tube (*a b*), placed in a furnace in which it could be heated to redness by means of charcoal or gas. At the other end this tube was connected with the tubes C and B, and with the bulbs A, these last contained caustic potash, and the others pumice-stone moistened with strong sulphuric acid for the purpose of taking up all moisture from the air, as well as of abstracting from it the whole of its ammonia and carbon dioxide. As soon as the tube *a, b*, had been heated to dull redness the stop cocks *r* were opened so as to let the air pass slowly into the apparatus. Entering the tube *a, b*, and coming in contact with the glowing copper, the whole of the oxygen was absorbed, only the nitrogen going over into the vacuous globe."

A certified copy of the part of the foregoing publication referred to by me will be filed herewith, marked "Defendant's Exhibit No. 16."

Storer's "First Outlines of a Dictionary of Solubility."

Published in 1864, Page 16.

The following quotation is taken from Storer's "First Outlines of a Dictionary of Solubility," published in 1864, page 16:

"It can be said, in general terms, that alcohol is a good solvent for substances which contain much hydrogen, as resin, ethers, essential oils, including those which are oxygenated, etc., and many organic acids."

"Those gases which are abundantly absorbed by water likewise dissolve in considerable quantity in alcohol; and those which are sparingly absorbed by water are also taken up in small quantity only by alcohol; but alcohol generally takes up a greater quantity of a gas, bulk for bulk, than water."

The two paragraphs just quoted from Storer appear, also, in Gmelin's Handbook of Chemistry, Volume 8, page 257, which book was published in London in 1853.

146 A certified copy of the part from Storer's "First Outlines of a Dictionary of Solubility" to which I have just referred will be filed herewith, marked "Defendant's Exhibit No. 30," and the part from Gmelin's "Handbook of Chemistry", to which I have just referred, will be filed herewith, marked "Defendant's Exhibit No. 31."

Stearns Patent, No. 224,240.

Dated February 3, 1880.

This patent discloses that long before the application for the patent in suit a method was known of charging carbonate of soda with carbonic-acid gas in a closed chamber by first molding said substance in perforated blocks and then subjecting same to the action of the gas, namely, carbonic acid gas. The soda reacts to the gas and forms a vehicle to receive the gas, and thus it is clear that the idea of the absorption of a gas, so far as broadly disclosed in the Claude & Hess patent, No. 664,383, is anticipated by the Stearns patent, as the soda in blocks receives the gas in substantially the same manner as the solvent in the patent in suit absorbs and dissolves the acetylene gas. The Stearns patent to which I have referred will be offered in evidence as Defendant's Exhibit No. 17.

German Patent to Webb, No. 58,927.

Dated 1890, Ausgegeben (i. e., published), September 21, 1891.

A large part of the novelty attributed by Judge Quarles to the alleged invention of the Claude & Hess patent, No. 664,383, would have been subtracted therefrom if Judge Quarles had had before him this Webb German patent. It shows the injustice to the commercial world that is perpetrated by a decision of a court based upon an incomplete disclosure of the prior art to compare the decision of Judge Quarles in the Milwaukee case with this Webb German patent, as nearly everything found in the Claude & Hess patent in suit is found in this prior German patent, which discloses, to adopt the language of Claims 2 and 5 of the Claude & Hess patent in suit, a prepared gas package made up of a metal tank in which compressed gas is contained, said gas being held in absorption and in a porous sub-

stance that fills said tank, the tank being, also furnished with a reducing-valve, which is adapted to regulate the outlet or escape of the gas from the tank through the burners. The structure of Claim 1 of the Claude & Hess patent being here disclosed, it is most
147 striking that, in addition, the Webb German patent states that such gas package, as a whole, is intended for the lighting of omnibuses, railway coaches, and the like. Of course, there is no difference between an omnibus and a taxicab when the lighting of the road in front of them is considered. The Webb patent is a full anticipation of the mechanical construction defined by Claims 1, 2 and 5 of said Claude & Hess patent, and the use of a solvent holding acetylene gas in solution to be absorbed within a porous filler, as in the "Prest-O-Lite" tanks, could not amount to invention over the use in the Webb German patent of a porous filler, a metal tank, and highly compressed gas absorbed in said porous filler and contained in said Webb tank. The Webb German patent to which I have referred is the one filed in this case marked Defendant's Exhibit No. 18.

Dixon United States Patent, No. 567,764.

Dated September 15, 1896.

Not much difference can be discerned between this patent and the apparatus of the Claude & Hess patent, No. 664,383, since the Dixon patent reveals years in advance of the application for the Claude & Hess patent a gas tank or holder having within it a reducing-valve for controlling the outlet of gas held within the tank under high pressure. The Dixon patent to which I have just referred is herein offered in evidence as Defendant's Exhibit No. 19.

Gearing British Patent of 1894.

A reducing-valve in an apparatus for distributing acetylene gas under pressure is exhibited in this patent, Defendant's Exhibit No. 20 being a certified copy thereof.

Saunders & Patton Patent, No. 394,018.

Dated December 4, 1888.

The Patent Office cited this prior patent against the application for the Claude & Hess patent, No. 664,383. It exhibits a reducing-valve called in its specification "an automatic pressure-regulator valve C," which valve is intended to regulate the outlet of gas from a storage reservoir for lighting and heating railway cars.

Abel British Patent of 1887.

This patent makes the same disclosure as the Saunders & Patton patent, and the Patent Office cited it against the application for the Claude & Hess patent in suit.

148 The Saunders & Patton patent to which I have referred will be offered in evidence as Defendant's Exhibit No. 21, and said Abel patent will be offered in evidenec as Defendant's Exhibit No. 22.

Schulke Patent No. 577,989 of 1897.

The Schülke patent dated March 2, 1897, in evidence in this case as Defendant's Exhibit No. 23, was cited by the United States Patent Office against the application for the patent in suit. It exhibits the use of an automatic pressure-regulating apparatus for governing the flow of heavy hydrocarbon illuminants under high pressure to a burner.

Hill Patent No. 261,607 of 1882.

Reducing-valves "to govern varying pressures" were well known as early as and much before the date of this patent, which will, however, serve to show that prior to July 25, 1882, reducing-valves were used to deliver compressed air (i. e., a compressed gas), at a uniform pressure, notwithstanding the diminution or irregularities of the pressure of same in the reservoir, said Hill patent being in evidence in this case as Defendant's Exhibit No. 24.

"Annales de Chimie et de Physique."

Published in Paris, France, in 1866.

This publication conclusively proves that the solubility of acetylene in a number of different liquids, including alcohol, which latter is mentioned in the Claude and Hess patent, was known more than thirty (30) years prior to the date on which Claude and Hess filed their application which eventuated in the patent in suit. The publication mentions on page 425 (Vol. IX) that acetylene gas is soluble in different solvents at about 18 degrees C., as follows: Water, carbon disulphide, and amylene hydrate dissolve about their volume of acetylene; illuminating petroleum, 1½ its volume, essence of turpentine and carbon perchloride, 2 volumes; amylic alcohol and styrolin, 3½ volumes; chloroform and benzine, 4 volumes; and crystallizable acetic acid and absolute alcohol, nearly 6 volumes.

As the publication mentioned is a French one, and as Claude and Hess were both residents of France, it is but natural to conclude or infer that their knowledge of the solubility of acetylene gas in alcohol was obtained from the same, and in addition seems to account for the fact that

149 "Each and all of the Claude and Hess six claims are all restricted to a reducing valve."

At this point I desire to call attention to, and I am greatly impressed by the fact that in the application of Claude & Hess which eventuated in the patent in suit, and, during the prosecution of the same, no claim or claims were ever submitted for the consideration of the Patent Office which omitted a reducing-valve in one form or

another. Not a single one of the claims of the patent in suit nor its specification assert, state, imply, or claim that the alleged invention of that patent resides in dissolving acetylene gas in alcohol or acetone, the solvents mentioned in the specification of the patent in suit (line 77, page 1), or in the discovery by Claude & Hess that acetylene gas is soluble in alcohol or acetone, but the principle and spirit of the alleged invention of the patent in suit is manifest from the specification, as pointed out above, and by reason of the specific limitations contained in its claims to reside in the operation of automatic means for permitting the gas to escape at substantially uniform pressure and in the location of such means and the gas outlet at a point above the level of the solvent. The part of the foregoing publication to which I have just referred will be filed in this case marked Defendant's Exhibit No. 4.

"Journal of the Franklin Institute."

Volume 139, Page 324, Published May, 1895.

This publication contains an anticipation commercially considered of all those claims of the Claude & Hess patent, No. 664,383, that mention a solvent broadly without restriction to acetone (i. e., all of the claims of the Claude & Hess patent except Claim 5, which is limited to the use of acetone), since this publication says on page 324 of acetylene: "It is soluble in water in about the same proportions as carbon dioxide, that is, at 64° F. water will absorb its own volume of the gas. Absolute alcohol and glacial acetic acid dissolve about six times their volume."

While this quotation does not describe the apparatus for containing the acetylene gas held in solution in water or alcohol or acetic acid, yet any one will readily understand that some kind of a container is necessarily implied, and, in view of the decision of Judge Quarles in the Milwaukee case, a bottle with a stopper is all the apparatus that is required (conjoined with the information contained in the quotation just made from the "Journal of the Franklin Institute," published May, 1895, or in the 1866 volume of "Annales de Chimie et de Physique" mentioned above), completely to anticipate Claims 1, 2, and 5 of the Claude & Hess patent in suit, unless Claims 1 and 2 are limited and restricted to the explicit requirement contained therein of a reducing-valve and Claim 5 similarly limited and restricted and additionally limited and restricted to the use of acetone as the solvent. The quotation from the "Journal of the Franklin Institute" that I have just quoted will be found in evidence in this case designated as Defendant's Exhibit No. 5.

The Dickerson Patent, No. 662,258.

Dated November 20, 1900.

This patent was issued by the United States Patent Office more than a month before the issuance of the Claude & Hess patent in suit, No. 664,383, as said Claude & Hess patent was not issued until

December 25, 1900. Prima facie, therefore, this Dickerson patent anticipates, by what it discloses, the patent in suit, since the date of the Claude & Hess patent is presumed to be that of its issuance, unless evidence is offered to antedate the date of issuance to show the date of filing the application for the patent. The date of the filing of the application for said Dickerson patent, No. 662,258, is, however, shown by the certified copy of the file-wrapper and contents of the application for said Dickerson patent, designated as Defendant's Exhibit No. 7, to be long in advance of the date of issuance of said Claude & Hess patent, that is to say, the application for said Dickerson patent is shown by Defendant's Exhibit No. 7 to have been filed in the United States Patent Office on April 8, 1897, the oath to same having been executed on April 2, 1897.

The application for said Dickerson patent was evidently prepared with better knowledge of the prior art than was possessed by Judge Quarles when deciding the Milwaukee case and with better knowledge of the prior art than the information thereof disclosed by the record in said Milwaukee case, since the specification of said Dickerson patent, as filed in the United States Patent Office on April 8, 1897, and as contained in the patent as issued on November 20, 1900, contained the photograph of the state of the art on April 2, 1897, embodied in the following statement in the specification (lines 40-52) of said Dickerson patent: "I do not claim to the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit
151 myself to fusel-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent."

Thus it is shown that at least as early as April 2, 1897, it was well known that acetone as well as alcohol is a solvent for acetylene gas under high pressure. To those skilled in the art, it is, of course, obvious that liquefied acetylene is acetylene gas under very high pressure, as gases do not liquefy except under high pressure, the degree of pressure being dependent upon the kind of gas, and acetylene gas, being like other gases, including air, in its property of liquefaction.

A most significant fact regarding the Milwaukee case is the fact that said Dickerson patent, No. 662,258, was neither placed before the court in the evidence in that case nor even referred to in defendant's answer. Doubtless, the decision of Judge Quarles would have been very different if this Dickerson patent had been brought to his attention.

The certified copy of the file-wrapper and contents of the application for said Dickerson patent shows that the solution of acetylene gas in different solvents was known to Edward N. Dickerson, the applicant for said patent, and to Dr. Julius J. Suckert as early as the year 1895, and a second affidavit by Dr. Julius J. Suckert, which I am informed will be filed on behalf of the defendants in this suit, shows that the solution of acetylene gas in said various solvents, and among them acetone, was known to said Edward N.

Dickerson and to said Dr. Julius J. Suckert as early as March or April, 1895, which knowledge by said Edward N. Dickerson and Dr. Julius J. Suckert included the knowledge of the fact that acetone had the capacity for absorbing many times its own volume of acetylene and formed under pressure a supersaturated solution thereof.

The Dickerson & Suckert Patent, No. 582,274.

Dated May 11, 1897 (Application Filed March 4, 1896).

Defendant's Exhibit No. 32, which is a certified copy of the file-wrapper and contents in the matter of the application for the Dickerson & Suckert patent, No. 582,274, dated May 11, 1897, shows that the application for said Dickerson and Suckert patent was filed in the United States Patent Office, March 4, 1896. This patent exhibits a closed tank or vessel A containing compressed acetylene gas and a reducing-valve E governing the gas outlet therefrom for the purpose of automatically regulating the escape of the gas to the burners at substantially uniform pressure. Apparently
152 through oversight, this patent was not cited by the Patent Office against the application for the Claude & Hess patent, No. 664,383, and it was not before the court in the Milwaukee case. It discloses the entire combination of structure called for by Claim 1 of said Claude & Hess patent. It, furthermore, discloses the entire combination of Claim 2 of said Claude & Hess patent, except the solvent. Moreover, it shows the entire combination of Claim 5 of the Claude & Hess patent, No. 664,383, except the specific solvent acetone, as not only solvents for acetylene gas under pressure were known long prior to the date of this Dickerson & Suckert patent, such, for instance, as alcohol mentioned in the specification of the Claude & Hess patent, No. 664,383, but numerous others, including acetone. Obviously, no invention would reside in putting a solution of acetylene gas in acetone or other solvent in the old tank of the Dickerson & Suckert patent, as that patent shows a reducing-valve for the very purpose contemplated by the Claude & Hess patent in suit. It should not be forgotten that the whole problem supposed to have been dealt with by the Claude & Hess patent, No. 664,383, was the safe storage of highly compressed acetylene gas, and the delivery thereof to the burners "at substantially uniform pressure" "only slightly above the atmospheric pressure" and "substantially the same when the receptacle is fully charged as when it is nearly exhausted." The delivery in this prescribed manner can be accomplished by the reducing-valve of the Dickerson & Suckert patent, No. 582,274; the tank is the same in the Claude & Hess patent in suit as in said Dickerson & Suckert patent; and the safety was secured by the application to the Claude & Hess patent of the porous filler of the Fouché patent, No. 727,609. In the light of these explanations and in view of the fact that the use of alcohol, acetic acid, benzene, chloroform, turpentine, acetone, and water as solvents for acetylene gas was known many years before the filing of the application for said Dickerson & Suckert patent, the following quoted from the specification of said Dickerson &

Suckert patent, in connection with the rest of the description in said patent, constitutes a complete anticipation of Claims 1, 2, and 5 of the Claude & Hess patent in suit: "In applying liquefied or compressed acetylene gas to the illumination of houses or for other purposes where the gas must be reduced in pressure to enable its practical application it is necessary to effect the reduction in pressure by mechanical appliances, technically known as 'reducing-valves' and ordinarily operating by means of a diaphragm or piston or float, which, when the reduced pressure exceeds the pre-
153 scribed limit, closes off by means of suitable levers, the valve feeding the compressed gas to be reduced in pressure."

Abandoned Claude & Hess Application for Method or Process Patent.

The Patent Office files before the Primary Examiner, the Board of Examiners-in-Chief, and the Commissioner of Patents in Person relative to the application of Claude & Hess for patent for method of storing acetylene gas shows that the method described in the patent in suit of storing acetylene gas was old at the date of the application for the patent in suit, and the references cited by the Patent Office against said method application of Claude & Hess resulted in the attorneys for Claude & Hess adopting the dernier ressort when the appeal of said method application was submitted to the Commissioner of Patents in Person of trying to drag into the method application the reducing-valve of the apparatus application that resulted in the patent in suit. In other words, with all the ingenuity that good patent lawyers could apply to the method application, they could discern no novelty in the method itself and, therefore, sought to import novelty into it by suggesting that the reducing-valve of the apparatus was implied in the method claims. In the manner just stated, Claude & Hess admitted in the prosecution of their application for patent for the method of storing acetylene gas described in the patent in suit that said method was old, but that a spark of novelty could be said to be imported into it by the alleged implication in said method claims of a reducing-valve or other automatic control for the flow of gas, which was contemplated by said method claims. Judge Quarles in his opinion in Commercial Acetylene Company v. Avery Portable Lighting Company, 166 Fed. 907, said in lines 6-3 from the bottom of page 909 that the apparatus was old before the application for the patent in suit and that the novelty resides solely in the method. Of course, Judge Quarles would not have held the method to be new if he had read the file of the method application, but, as he had ruled that out of evidence in the Milwaukee case, he could not consider it and in his opinion expressly states that he did not consider it. In brief, however, Judge Quarles admitted the apparatus to be old and Claude & Hess in the Patent Office proceedings admitted the method to be old. That the method was, unquestionably, old is furthermore shown from
154 the fact that Claude & Hess abandoned the application for patent for the said method of storing acetylene gas, which method is the same described in the apparatus patent No. 664,383,

and took no appeal from the adverse decision of the Commissioner of Patents in Person, as Claude & Hess might have done, to the Court of Appeals of the District of Columbia. All the tribunals of the Patent Office concurred in deciding that said method was old, and, finally, Claude & Hess concurred in that opinion too by abandoning the method application.

The claims presented in the Claude & Hess abandoned application, especially those that were appealed, show but one distinction between them and Claim 1 of the Claude & Hess patent in suit, namely, the complete absence of the reducing-valve included in Claim 1 of the Claude & Hess patent in suit, which is therein referred to as means for controlling the gas outlet whereby the gas may escape therethrough at substantially uniform pressure. As the Patent Office rejected the method application (which subsequently became abandoned) and as the claims of the same differed from the Claim 1 in the patent in suit solely by the omission of a reducing-valve, however expressed in Claim 1 of the patent in suit, it naturally follows that the presence of the reducing-valve in Claim 1 of the patent in suit constituted the ground on which the Commissioner of Patents allowed the apparatus application (now the patent in suit), while its absence from the method application constituted the ground on which the latter was refused.

I have examined the record in the Milwaukee case known as Commercial Acetylene Company v. Avery Portable Lighting Company, 166 Fed., 907, to which I have referred above. This enables me to state that the prior art to which I have referred in my affidavit as anticipating or limiting the claims of the Claude & Hess patent, No. 664,383, was not in evidence in any way in said Milwaukee case, the only thing mentioned in the foregoing part of my affidavit that was at all referred to in the record in said Milwaukee case being the casual reference to "Henry's Law." As Judge Quarles in his opinion expressly says that he did not feel at liberty to consider the files of the Patent Office concerning the Claude & Hess application for patent for method of storing acetylene gas, same having been objected to on the ground of laches in offering same in evidence and for no other reason, it is obvious that Judge Quarles did not have before him, when writing his opinion in the Milwaukee case, data
of such character as would enable him to form a proper idea
155 of the relation that the Claude & Hess patent, No. 664,383,
bore to the prior art. In other words, its claims are manifestly of most limited nature, and even though Claims 1, 2, and 5 are clearly invalid, Judge Quarles, having no impugning evidence before him, erroneously held them to be valid and of broad scope.

There can be no doubt that if the Patent Office files in connection with the application of Claude & Hess for a method patent had been considered by Judge Quarles light would have been thrown on the claims of the patent in suit which would have precluded the findings of the court in the Milwaukee case. The evidence found in the exhibits marked Defendant's Exhibits Nos. 9, 10 and 11 is, therefore, so far as this case is concerned, new evidence.

That the solubility of acetylene in various liquids was known in

this country before the date of the Claude and Hess application for the patent in suit is amply proven by the following contained in Defendant's Exhibit No. 7.

United States Patent Office.

Room 39.

In the Matter of the Application of Edward N. Dickerson for Improvement Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

STATE OF NEW YORK,
City and County of New York:

Edward N. Dickerson, being duly sworn, deposes and says: I conceived of the invention here in controversy as early as the year 1895. At that time the invention was reduced to practice by mingling liquefied acetylene with various solvents, among others, fusel-oil, benzine, and others. They were so mingled in glass tubes, and carefully studied with reference to increase in volume. The reduction to practice of the invention was at that time complete.

E. N. DICKERSON.

Subscribed and sworn to before me this 21st day of January, 1898.

W. LAIRD GOLDSBOROUGH,
Notary Public, New York Co.

156 United States Patent Office.

Room 39.

In the Matter of the Application of Edward N. Dickerson for Improvement Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

STATE OF NEW YORK,
City and County of New York:

Julius J. Suckert, being duly sworn, deposes and says: I am co-inventor with Mr. Edward N. Dickerson in regard to several processes for the liquefaction of acetylene. In the year 1895, at his suggestion, I caused mixtures to be made of liquefied acetylene gas with a number of solvents, among others, fusel-oil, benzine, and others. These mixtures were carefully studied with reference to the increase in volume and other physical facts at that time.

JULIUS J. SUCKERT.

Subscribed and sworn to before me this 21st day of January, 1898.

[SEAL.] W. LAIRD GOLDSBOROUGH,
Notary Public, New York Co.

The Milwaukee Case.

Had Judge Quarles had the prior art herein referred to before him in the case of Commercial Acetylene Company v. Avery Portable Lighting Company, at Milwaukee, it would have been impossible for him to have drawn the incorrect conclusion expressed below:

"There is one feature of the Claude & Hess discovery which is of paramount importance, namely, the peculiar affinity of acetone for acetylene, and especially the modifying influence of each upon the other when combined in a supersaturated solution. Acetone is volatile and inflammable, and its vapor when mixed with air is explosive. Acetylene is highly explosive. Defendant suggests no law of physics, or treatise, *or source of information* that would have led to the discovery that both elements would become harmless when so combined. Claude & Hess were the first to make known these peculiar and wonderful properties which they must
157 have discovered by actual experiment. This fact is attested by the literature of the art and by the testimony here adduced. * * * In concluding the discussion on the question of patentability, we may state concisely what Claude & Hess have accomplished by their discovery. First. By equipping the gas package with acetone as a solvent, they have enormously increased the storing capacity of the tank, rendering it possible to store under moderate pressure 300 times as much acetylene gas as could otherwise be compressed therein. Second. They have disclosed the chemical changes that take place in both gas and liquid when so combined, which render both innocuous and capable of safe transportation" (italics mine).

The credit which Judge Quarles has given to Claude & Hess for the use of acetone as a solvent for acetylene gas is obviously misplaced, since the 1866 publication Annales de Chimie et de Physique mentions *alcohol* as a solvent, while so far as *acetone* is concerned Claim 5 of the Claude & Hess patent is the only one which mentions *acetone,* and even it is shown by the Suckert evidence to have been known in this country before the date of the Claude & Hess application resulting in the patent in suit. As concerns Claims 1 and 2 of the Claude & Hess patent (which Judge Quarles held to be valid), same merely mentions a "solvent" which reads equally well upon *alcohol* as upon *acetone,* the only two mentioned in the Claude & Hess patent.

In the Milwaukee case the prior art was notable for its absence, and only its absence made it possible for Judge Quarles to view the Claude & Hess patent in the language above quoted. The only prior art offered in evidence in said Milwaukee case was directed against the Fouché patent on which the suit was based as well as upon the Claude & Hess patent, No. 664,383, and none was offered

in that case in any manner to affect the Claude & Hess patent, No. 664,383, which thus appeared to Judge Quarles as a strikingly original invention, though, as a matter of fact, it possessed at the date of the application for the patent in suit little if any novelty.

Expiration of British Patent No. 29,750 of June 30, 1896, to Claude & Hess and Effect Thereof on Term of Patent in Suit.

The term of the patent in suit is affected by the expiration on June 30, 1910, of the British patent No. 29,750, dated June 30, 1896.

158 Judge Quarles having sustained the patent in suit as a method patent, in his opinion stating that the apparatus alone was non-patentable, it follows that the British patent to Claude & Hess, No. 29,750, of June 30, 1896, is for the same invention as that patent which Judge Quarles so sustained. Laying all quibbles aside, it is manifest at a glance that the substance of both patents is the same, and it must, therefore, be immaterial as to exactly how the claims of said British patent or of the United States patent, No. 664,383, are phrased. More than that, if the Claude & Hess United States patent, No. 664,383, is not construed as broadly as Judge Quarles construed it, the device of the defendants in the present case cannot infringe, but, if the patent involved in this suit is construed broadly enough to hold within its scope the "Fireball" gas tanks, the effect necessarily is so to expand the scope of the United States patent, No. 664,383, as to make it for the same invention as the British patent No. 29,750 of 1896, from which it follows that under section 4887 R. S. U. S. United States patent No. 664,383 expired on June 30, 1910.

British patents are granted for a term to expire fourteen years from their dates. Obviously this defense did not exist at the time the Milwaukee case was decided.

Claim 6 of said British patent is so expressed that, as British patents are interpreted by the British courts, the "pressure-regulator," which means a reducing-valve, mentioned in the specification of the British Claude & Hess patent, No. 29,750, of June 30, 1896, is claimed in said claim, which I will here quote:

"6. The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified."

In other words, although the title of said British patent is "An Improved Method of Storing Acetylene for Lighting and other purposes," yet there is no doubt that, as British patents are interpreted and construed, it is for both the method of and apparatus for storing acetylene gas, and this is, particularly, true in view of the claim just quoted.

French Patent to Claude & Hess No. 257,679, Dated June 30, 1896, and Certificates of Addition Thereto, Dated June 11, 1897, and April 26, 1898.

French patents are granted for a term of fifteen years from their respective dates, and certificates of addition to French patents
159 expire on the same dates as the expiration of the patents to which they are added. A certified copy of the Claude & Hess French patent, No. 257,679, is in evidence as Defendant's Exhibit No. 26 and a certified copy of the certificate of addition thereto dated June 11, 1897, will be filed, herewith, marked Defendant's Exhibit No. 26*a* and a certified copy of the certificate of addition thereto dated April 26, 1898, will be filed, herewith, marked Defendant's Exhibit No. 26*b*. Both said certificates of addition and said original patent No. 257,679, to which they are added, expired June 30, 1911. No drawings are attached to the French patent No. 257,679, of June 30, 1895, but to each of said certificates of addition, in evidence as Defendant's Exhibits Nos. 26*a* and 26*b*, drawings are attached, which drawings show needle valves for the control of the escape of the acetylene gas out of the solvent. Therefore, on June 30, 1911, Judge Quarles's needle valve expanded interpretation of Claims 1, 2, and 5 of the Claude & Hess patent, No. 664,383, expired. His decision, as shown above, was erroneous, but, even so, the scope that he gave to Claims 1, 2 and 5 of the Claude & Hess patent, No. 664,383, necessarily expired June 30, 1911, because French patents have no claims and are construed by all that appears in them, and as needle valves are shown in the drawings of both of said patents of addition of June 11, 1897, and April 26, 1898, the monopoly that Judge Quarles erected, consisting of a closed vessel, acetone contained therein, acetylene gas under pressure dissolved in said acetone, and a needle valve controlling the escape of the gas, obviously expired when the term of said French patent No. 257,679 and the patents of addition thereto expired, namely, on June 30, 1911.

It may be remarked that this defense was not passed upon by Judge Denison in the Detroit case, and, of course, was not available at the time Judge Quarles decided the Milwaukee case.

German Patent No. 97,953 Granted to Claude & Hess, August 27, 1896.

This German patent will expire at midnight August 26, 1911. German patents are granted for a term of fifteen years from their respective dates. I state this not only from my knowledge of German patent law, but, also, call attention to the certificate accompanying Defendant's Exhibit No. 28, which exhibit is a certified copy of said patent, said certificate stating that said patent will expire at the date above stated. There is no difference whatever between said German patent and United States Claude
160 & Hess patent No. 664,383 in suit. Not only is the substance of the inventions described in each the same, but the claims, also, correspond to each other, even to the extent that the valve of Claims

1, 2, and 5, of said Claude & Hess patent is claimed, also, in the claim of said German patent. In the claim of the German patent the valve is denominated a "pressure-regulator," but this term means the same thing as the term "reducing-valve" found in the specification and claims of the United States Claude & Hess patent, No. 664,383, and which means the same as the element in Claim 1 of the Claude & Hess patent: "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." The description in the specification of the Claude & Hess German and United States patents relates to precisely the same subject-matter. The claim of the German Claude & Hess patent is for precisely the same subject-matter as Claims 1, 2, and 5 of said United States Claude & Hess patent. Though Judge Denison decided that because of difference that he thought he saw between the claims of the Claude & Hess British patent, No. 29,750 of 1896, and the claims of the Claude & Hess United States patent in suit, and though Judge Kohlsaat decided in a manner exactly opposite to Judge Denison, stating in an elaborate opinion that substance is more important than form and that the substance of the Claude & Hess British patent and of the United States patent in suit is the same, and, therefore, that the latter expired with the expiration of the former, yet no difference of opinion could exist between Judge Denison and Judge Kohlsaat in dealing with the German Claude & Hess patent since even the claim of the German Claude & Hess patent is in exact accordance with Claims 1, 2, and 5 of the United States Claude & Hess patent both as to substance and as to form and terms. In other words, even if Judge Denison were correct in holding that the Claude & Hess United States patent being for an apparatus is not limited as to its term by expiration of the process British patent to Claude & Hess, nevertheless, as the German Claude & Hess patent is for an apparatus like the United States patent to Claude & Hess, the Claude & Hess patent in suit must expire at the same time as the expiration of said German patent because of absolute identity of invention between the two.

Reducing-valves.

The question naturally arises in this case, "What is a reducing-valve?"

161 Authorities concur in saying that a reducing-valve is an automatic pressure regulator, one in which an automatic device regulates the pressure, whereby decrease in pressure of the gas on one side of the reducing-valve will cause its Automatic replenishment through the reducing-valve by reason of the diminished pressure upon that side.

The following extracts taken from the publications noted will show the sense in which the term "reducing-valve" is used and accepted:

"Reducing valve, a device for automatically maintaining a diminished pressure of steam, air, gas, etc., in a pipe, or other receiver, which is fed from a boiler or pipe in which the pressure is higher than is desired in the receiver."—Webster's International Dictionary, 1907.

"Reducing-valve.—A spring or lever loaded valve, similar to a safety valve, whereby steam is maintained at a lower pressure within a pipe than in the boiler which supplies it. Supposing the valve to be set at 60 lbs. pressure, it remains open until the pressure in the pipe shall have risen to that figure, when it closes, opening again as soon as the pressure begins to diminish and closing as it rises towards the upper limit."—Hawkins' Mechanical Dictionary.

On the other hand, a plain, simple, ordinary "valve" is defined in Webster's International Dictionary, 1907, as follows:

"A lid, plug, or cover applied to an aperture so that by its movement, as by swinging, lifting and falling, sliding, turning, or the like, it will open or close the aperture to permit or prevent passage, as of a fluid."

Hawkins' Mechanical Dictionary, 1909, defines a valve as:

"A lid or cover to an aperture, so formed as to open a communication in one direction, and close it in the other by lifting, turning or sliding."

It is absurd to say that an ordinary valve is a "reducing-valve" because when said valve permits the escape of some gas from a tank the pressure of the remainder of the gas in the tank is diminished or reduced. If every valve is a reducing valve, why the necessity of calling some valves "reducing-valves" and others simply "valves." The dictionaries recognize the distinction, the Patent Office does, and so do workers in the arts which have to do with valves. I have said that the Patent Office recognizes the distinction between "reducing-valves" and plain "valves" and to bear out my statement I refer to the fact that in Division 30, of the Patent Office there is an entire class, No. 50, entitled "Fluid Pressure Regulators," which is divided into a number of different sub-classes, while in an entirely different Division of the Patent Office, namely, Division 43, there is a class No. 137, "Water Distribution," which includes plain or ordinary valves, whether turning, reciprocating or sliding, as shown by the titles below, which, it will be noted, are in strict accord with the quotations from the dictionaries noted in connection with "valves":

162

4. Reciprocating Valves.
5. Sliding Gates.
7. Turning Plugs.

It can no more be truthfully said that every valve is a reducing valve, than it can be said that every quadruped is a horse, simply because a horse happens to be a quadruped.

In fact, I can see nothing better to illustrate the distinction between an ordinary "turning plug" valve and a reducing valve than can be shown by the Claude & Hess patent (in suit) itself, since the element "c^3" is stated to be "a valve" (page 1, line 90) and in the next breath the Claude & Hess patent states that "d" is a "reducing valve" (page 1, line 97).

The difference in function, structure, and purpose of the elements "c^3" and "d" in the Claude & Hess patent makes it ridiculous to say that the cock "c^3" is a reducing-valve the same as "d," and still this construction is urged by complainant in the face of its own patent

which conclusively proves the absurdity which is endeavored to be perpetrated.

Again the following matter taken from page 2, lines 13-20, show how impossible it is to say that the valve "c^3" in the Claude & Hess patent can perform the functions appearing in the following matter, which latter gives foundation and basis for terming "d" a "reducing-valve":

"It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted."

The matter just quoted therefore defines the meaning of the term "reducing-valve" and thereby distinguishes the latter from the ordinary valve shown at "c^3" in the Claude & Hess patent. As defendant's valve is a needle valve of the same general broad character and type as the valve "c^3," how then can it be said that defendant's needle valve 8 (Patent No. 987,000) is a "reducing-valve"?

Very obviously, the escape of gas from the "Prest-O-Lite" tank shown in Defendant's Exhibit No. 1, and from defendant's
163 tank shown in Defendant's Exhibit No. 2, is not and cannot be substantially the same when the receptacle is fully charged as when it is nearly exhausted, but in each case the gas discharge is subject to the law stated in the Claude & Hess patent in suit, that "the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom" (Page 1, lines 95-97).

This is entirely unlike the "substantially uniform pressure" of claim 1 of the patent in suit, and is unquestionably outside of the scope of said claim 1, which is positive and certain in its inclusion of a pressure regulator however defined in said claim. Not only do Defendant's Exhibits Nos. 1 and 2, present structures which are not reducing valves, or pressure regulators, but said Exhibits Nos. 1 and 2 further do not present the mechanical equivalent for a reducing valve, or pressure regulator.

The Apparatus of the Claude & Hess Patent Dangerous in Use.

The "Prest-O-Lite" tank so marked in Defendant's Exhibit No. 1, contains a porous substance, of a character disclosed in the Fouché patent No. 727,609, a certified copy of which is filed herewith marked "Defendant's Exhibit No. 34." In view of the fact that the "Prest-O-Lite" tanks are not, as above stated, constructed in accordance with the Claude & Hess patent in suit, makes it apparent that in actual use apparatus constructed in accordance with said patent is defective, which is true, because, according to the Claude and Hess patent, free gas (gas not held in solution in the solvent) is present in the upper chamber of vessel a formed by the partition d^3, and since the purpose of the solvent is to hold the gas in order to diminish its explosibility, it is obvious that the free gas in the upper chamber of vessel a is dangerous and as likely to explode as any acetylene gas that has never been dissolved in a liquid.

While it is true that while the gas held in solution in solvent *b* is safe enough from explosion, yet no such safeguard against explosion is provided for the gas in the top chamber of vessel *a* (the chamber above partition d^3). In other words the Claude & Hess patent merely provides against explosion of a part of the gas, not the whole volume thereof. At this point it is timely to say that the "Prest-O-Lite" tank shown in Defendant's Exhibit No. 1 is an excellent example of a device which will not infringe the claims of the Claude & Hess patent in suit.

164 In this Exhibit No. 1 of defendant the vessel *a* is provided with a valve c^3, located in the outlet-passage *c*, which is neither "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" nor the mechanical equivalent therefor. The valve c^3 is a simple valve, of ordinary, more or less, common type which permits, when open, escape of the gas from vessel *a*.

The gas-package shown by "Defendant's Exhibit No. 1," is, therefore, not an infringement of Claim 1 of the Claude & Hess patent, not being within the scope of said claim and not constructed in accordance therewith.

Comparing Claim 2 of the Claude & Hess patent with Defendant's Exhibit No. 2," and assuming the tank shown in the Exhibit to contain "a solvent of acetylene" and "acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution," the gas-package of Defendant's Exhibit No. 1 is clearly seen not to be constructed in accordance with said claim and not to be within the scope of said claim nor an infringement of said claim, because of the omission therefrom of the "reducing-valve" specifically required by said claim, there being no mechanical equivalent for said reducing-valve in the tank shown in "Defendant's Exhibit No. 1," the valve c^3 not being an automatic valve, but one operated by hand.

Claim 3 of the Claude and Hess patent requires a structure widely different from that shown in "Defendant's Exhibit No. 1." In the first place, the apparatus of said drawing is not adapted "for storing gas and delivering it at a substantially uniform rate," but only at a gradually decreasing rate. In the second place, the "valved inlet-pipe a^2" is not found present in the tank of the drawing, and, therefore, there is no "valved inlet-pipe a^2" in the tank of the drawing "extending to a point near the bottom of the chamber A." In the third place, the tank of the drawing omits the "horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2." In the fourth place, the "reducing-valve *d* applied to said opening" d^2 is absent from the tank of the drawing marked "Defendant's Exhibit No. 1." The only elements of claim 3 present in the tank of the drawing marked "Defendant's Exhibit No. 1" are the "shell or vessel *a*" and the "valved outlet-pipe *c*."

Claim 4 of the Claude & Hess patent, likewise, calls for a structure differing entirely from "Defendant's Exhibit No. 1" the tank of the

latter not having "an inlet-pipe opening into said vessel near
165 the bottom of the chamber provided for the solvent" nor being provided with a separate chamber for the solvent and not having "an outlet-opening from the solvent-chamber above the level of the solvent." Moreover, the tank of said exhibit does not possess "a reducing-valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity. The tank of the exhibit has neither a reducing-valve nor the equivalent thereof, and the valve c^3 of the drawing will not serve "to permit escape of the gas in regulated and uniform quantity," but will allow it to escape only in gradually decreasing quantity.

Comparing Claim 5 of said patent with "Defendant's Exhibit No. 1" I find that there is not present "a reducing-valve" nor one applied "above the level of the solvent." Therefore, there cannot be said to be any infringement.

Comparing Claim 6 with "Defendant's Exhibit No. 1," I find that the structure required by claim 6 is not present in said exhibit, since said claim requires the division of the gas-holder into two chambers as illustrated and described in the patent in suit, one of said chambers being intended to receive a gas solvent while the exhibit has but one chamber, which is not divided at all. Moreover, it does not possess an outlet for the gas located in the upper part of the solvent-chamber, nor has it "a reducing-valve applied to said outlet." The only elements of claim 6 that are shown in Defendant's Exhibit No. 1 are a "tight vessel" and "means for temporarily sealing the vessel completely," namely the valve c^3, consequently there can be no infringement of this claim 6.

"Defendant's Exhibit No. 1," which has been above compared with the claims of the patent in suit, is the tank or gas-package, that in complainants' evidence is called that of complainants, and the evidence shows large sales of gas-packages or tanks like that shown by "Defendant's Exhibit No. 1," but none of these tanks, known as "Prest-O-Lite" tanks, is made under the Claude & Hess patent in suit.

I have also read the affidavit of Mr. Percy B. Hills, which I understand is to be filed in this case, and desire to say that I concur in all his statements.

(Signed) ROYCE A. RUESS.

Sworn to and subscribed before me this 19th day of August, 1911.

[SEAL.] JAMES L. CRAWFORD,
Notary Public.

166 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Calvin M. Woodward, of lawful age, being duly sworn, on his oath deposes and says as follows:

I am a resident of the City of St. Louis, Missouri, and Emeritus Professor of Mathematics and Applied Mechanics at Washington University, St. Louis, Missouri, having been an active professor for thirty-eight years. I graduated from Harvard University in 1860, and have since then been continuously engaged in the teaching of the principles of mechanics as applied in the various branches of engineering. I have had occasion to read and thoroughly examine large numbers of letters patent for inventions both United States and foreign, and have testified many times as an expert in patent causes in the courts. I have read the Claude & Hess United States patent No. 664,383, dated December 25, 1900, and understand its contents. I have also read the Lukens patent No. 987,000, dated March 14, 1911, and understand that patent. I am thoroughly acquainted with all the different kinds of valves known to mechanics, and understand the operation of same. There are scores of different kinds of valves, each kind being denominated by its own appropriate or arbitrary name. The name of each kind of valve, however, denotes a characteristic belonging exclusively to
167 a particular kind of valve, and is not used indiscriminately as a reference to all kinds of valves. For instance, a ball valve is a valve in which the outlet is controlled by a ball. A flap valve is one where a device like a trap door governs the outlet, being held by a hinge. A needle valve is an exceedingly common form of valve, being in fact almost the commonest form of valve used in mechanical construction, and receives its name because of its tapering to a point more or less sharp adapted closely to engage a valve-seat of corresponding sharpness. The term "needle valve" would never by anyone acquainted with valves be applied to a flap valve or to a ball valve or to a float valve or to a gate valve or to a reducing-valve. These terms are not interchangeable. Each kind of valve is designated by its own name, and to all persons familiar with valve constructions the particular name used connotes the particular structure of the valve. A needle valve is merely a sharpened plug, and is almost the simplest form of valve known.

Two kinds of valves are the chief ones used for controlling the flow of gas: One is known as a reducing-valve, and the other is the needle valve to which I have referred above. There is no resemblance whatever between a reducing-valve and a needle valve, and by no stretch of the imagination can one be regarded as the mechanical equivalent for the other.

A reducing-valve is characterized by three features: (1) It operates automatically; (2) it consists of a plurality of parts and is more or less complicated; and (3) the effect and object of its use is to maintain steadily a low pressure on one side of the valve when a high pressure is maintained on the other side. For example: two (2) pounds on one side and one hundred (100) pounds on the other side; or half an ounce on one side and twelve (12) ounces on the other side. The low pressure is preserved even if no gas is being used. By means of an auxiliary screw and spring, such as is shown in the Claude & Hess patent No. 664,383, the ratio can be changed at will to suit a different high pressure, so as to keep the low pressure unchanged. To illustrate: Suppose the low pressure gas used in a laboratory for light and heat and that the pressure in the building is controlled by a reducing-valve. The instant a stop-cock is opened and the gas begins to escape the reducing-valve of itself opens just enough to supply the demand and closes again as soon as gas is turned off. If several burners are used at once, the valve still meets the demand by a wider opening. The low pressure is maintained. If the high pressure rises or falls the low pressure rises or falls in the same ratio. Thus, if the high pressure drops from one hundred (100) pounds to ninety (90) pounds, the low pressure would drop from two (2) pounds
168 to one and eight tenths (1.8) pounds; but a slight turn of the adjusting screw would restore the two (2) pounds. Several kinds of reducing valves are in common use, by means of each of which these results are produced.

A needle valve, on the other hand, has no automatic action. It controls the flow to a burner but not the pressure in the supply pipe to several burners. It is a mere plug that stops a hole when closed and more or less opens the hole when moved away by hand.

It is impossible to compare a reducing-valve and a needle valve, just as it is impossible to compare apples and bread. Both these edibles are food, but there the resemblance ceases. A reducing-valve and a needle valve are both valves, but there is no further resemblance. Both are used to control the flow of gases, but whether in a particular construction one will be used or the other depends upon the exigencies of the particular situation. A situation might necessitate the use of a reducing-valve, as, for instance, to maintain equality of light delivered by a large number of burners, such as in house-lighting, for which the Claude & Hess patent No. 664,383 seems to be primarily intended. In another situation where the same demands for regularity of flow and equalization of pressure would not exist, a throttle valve would answer the purpose. Manifestly the Claude & Hess patent contemplates something in the nature of a house-lighting system, and not the lighting of two automobile

headlights, since the entire specification of the Claude & Hess patent is permeated with references to the reducing-valve, it being mentioned directly many times and additionally referred to indirectly several times more. While the meaning of the term "reducing-valve" is so well known to all persons acquainted with the mechanic arts that there can be no doubt that it refers to an automatically-acting device more or less similar to the valve *d* shown in the drawings of the Claude & Hess patent No. 664,383, and that a needle valve is not and cannot be the mechanical equivalent therefor, yet, disregarding the common knowledge of all persons acquainted with this subject and disregarding, also, dictionary definitions, the specification of the Claude & Hess patent No. 664,383 itself clearly shows in what sense the patentees used the term "reducing-valve" and the term in claim 1 of that patent "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" by the language of the specification of that patent found on page 2, between lines 13 and 20, as follows: "It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the
169 supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted." Briefly, it is impossible for a needle valve to produce this result. The Claude & Hess patent No. 664,383 shows by its drawings, specification and claims that nothing but the automatic regulation of the gas pressure in the supply pipes was contemplated by the patentees. A needle valve being non-automatic is outside the contemplation and scope of the Claude & Hess patent No. 664,383.

The difference between the two kinds of valves compared above may be pointed out by a practical example. Suppose all the burners in a building be connected with a system of pipes which receives low-pressure gas (say, at ½ ounce) from a reducing-valve which receives gas at high pressure from an outside service pipe, say, under pressure of several ounces. As the lights are turned off late at night, one by one, the pressure throughout the building remains unchanged; and when all are turned off the pressure stands at ½ ounce just the same until the next morning. Now suppose a needle valve is put in the place of the reducing-valve and that it is open just enough to supply the burners when all are lighted. As soon as one burner is turned off the pressure on the other rises, and as more and more are turned off the pressure rises so that all become inoperative on account of the blowing. Finally when all are turned off the pressure in the building rises to the high pressure in the service pipe, and remains so.

I have examined a dissected "Prest-O-Lite" tank, filed herewith and marked "Defendant's Exhibit Sectioned 'Prest-O-Lite' tank", and I find that the gas outlet from said tank is controlled only by a needle valve operated by hand. This tank has no reducing-valve and no provision for the use of a reducing valve. Its valve is merely the ordinary needle valve that I have fully described above, and is non-automatic in character.

I have, also, examined a dissected "Fireball" gas tank, filed herewith and marked "Defendant's Exhibit Sectioned 'Fireball' tank", and another "Fireball" tank, filed herewith and marked "Defendant's Exhibit 'Fireball' tank", and I find said "Fireball' tanks to be constructed, so far as their gas outlet and valve are concerned, in accordance with Lukens patent No. 987,000, dated March 14, 1911, and I find same to contain a needle valve, and not to contain a reducing-valve. The "Fireball" tanks not only have no reducing-valve, but no provision for one, and the gas outlet from same is controlled only by a needle valve, which is operated by hand. This needle valve in the "Fireball" tanks is somewhat improved over ordinary needle valves in the respects pointed out in said Lukens patent No. 987,000.

170 The term "reducing-valve" is a technical term that always carries with it the signification of an automatically-acting device. It is not simply a throttle valve, which shuts off the supply more or less, but it acts automatically, which a throttle valve rarely does, and never in the manner of a reducing-valve as hereinabove explained by me. A needle valve belongs to the general class of throttle valves. If the term "reducing-valve" did not possess a significance connoting certain essential characteristics, there would be no sense in using that special term. Similarly, if the term "needle valve" did not connote a particular kind of valve, every valve would be a needle valve.

If gas under pressure is contained in a tank and some of it is allowed to escape, the pressure of the gas that remains within the tank will be decreased or reduced, but this does not constitute a valve that controls the outflow of gas a reducing-valve. So to say would be but a mere play upon words.

I have examined Defendant's Exhibit No. 1, and find that same is a correct drawing of a "Prest-O-Lite" tank. I have, also, examined Defendant's Exhibit No. 2, and find that same is a correct drawing of a "Fireball" tank.

In his opinion in the case of Commercial Acetylene Co. v. Avery Portable Lighting Company, 166 Fed., 907, at page 914 Judge Quarles says: "Four experts called by the defendant treat the expression 'reducing-valve' as a technical term, which they say means an automatic valve; and Prof. Haines contends that a valve is not entitled to be called a 'reducing-valve' although it does in fact reduce or regulate the pressure if it is manually regulated. He admits that he uses the term 'quite independently of the meaning of the two words comprising the term'. He cites two dictionaries that give a definition that favors his construction; but the dictionaries do not agree, because Mr. Little refers to the Standard, which is of equal authority, and the definition there is practical and not technical, and omits entirely the automatic feature." In his contention as above stated Professor Haines is entirely correct, and in the opinion expressed by the court Judge Quarles is altogether wrong, because the term "reducing-valve" does not refer to all kinds of valves, but to a specific form of valve. This being true, the question arises, To what form of valve does that term apply? As hereinabove stated by

me, it refers only to an automatic valve of the kind hereinabove described by me. The term "reducing-valve" is a technical term, and anyone who tries to blur this fact is endeavoring to mislead the courts. The definition of a "reducing-valve" given by Webster's dictionary, published many years before 1894, is as follows: "Reducing-valve.—A device for automatically maintaining a
171 diminished pressure of steam, gas, etc., in a pipe or other receiver, which is fed from a boiler or pipe, in which the pressure is higher than is desired in the receiver." The definition of a "reducing-valve" given by the Century Dictionary, published prior to 1894, is as follows: "Reducing-valve.—A peculiar valve controlled by forces acting in opposite directions. * * * The parts are so arranged that the valve opens to its extreme limit only when the pressure on the delivery side is at a prescribed minimum, closing the part in the valve-seat more or less when this minimum is exceeded. The pressure on the delivery side of the valve is thus kept from varying (except between very narrow limits) from its predetermined pressure, although the pressure on the opposite side may be variable, and always higher than on the delivery side. Such valves are much used for maintaining lower pressures in steam-heating and drying apparatus than is carried in the boiler. They are also used in automatic air-brakes for railways and in other pneumatic machines, and, in some forms, as gas-regulators for equalizing the pressure of gas delivered to gas-burners, etc. Also called pressure-reducing valve." The definition of a "reducing-valve" given by the Standard Dictionary, published prior to 1895, is as follows: "Reducing-valve.—A valve for maintaining uniform reduced pressure of a fluid, as steam or gas, on one side; used to connect steam-boilers with drying apparatus, automatic brakes, etc., and also in gas regulators." From the statement of Judges Quarles quoted above that the Standard Dictionary "omits entirely the automatic feature" in defining a "reducing-valve," it appears that Judge Quarles does not understand the definition given by the Standard Dictionary of a "reducing-valve," since to one acquainted with the different kinds of valves and the uses therefor, and particularly the uses for reducing-valves mentioned in said Standard Dictionary definition, the automatic feature of a reducing-valve is as plainly implied in the language of the definition thereof given by the Standard Dictionary as if the definition had explicitly contained the word "automatic."

(Signed) CALVIN M. WOODWARD.

Sworn to and subscribed before me this 25th day of September, 1911.

My commission expires May 8, 1915.

(Signed) GLADYS WALTON,
[SEAL.] *Notary Public.*

172 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Herman H. Born, M. D., being duly sworn on his oath deposes and says as follows:

I am by profession a physician and am engaged in the practice of medicine. My preliminary education consisted in what is known as the scientific course at Christian Brothers College, St. Louis, Missouri, where I graduated in 1885. I graduated from St. Louis Medical College in 1891. In 1891 I took one year's special course in physiological chemistry. I took one year's course in electro-therapeutics, physics, and chemistry with International Correspondence School, of Scranton, Pennsylvania. At St. Louis University, from 1904 to 1908, I was professor of electro-therapeutics and Roentgenology. At St. Louis University I have been professor of Dental Materia Medica and Therapeutics since 1908. For several years I have, also, been engaged in special work in analytical chemistry and the like and in the making of special investigations of chemical and other scientific matters.

I have, during the last two years or more, made special investigation regarding the nature, uses, and characteristics of acetylene gas and solvents therefor, and, during that time, have performed a great many experiments and have tested a large number of solvents for acetylene gas and have, moreover, performed numerous
173 experiments to test the modifying influence of divers substances upon various solvents for acetylene gas.

As the result of my various studies, investigations, experiments, and tests, I invented the particular solvent for acetylene gas that is used by the above-mentioned defendant Fireball Gas Tank & Illuminating Company, which it calls "Terpeline." This solvent is a compound of a plurality of liquids and other substances. It does not contain either acetone or alcohol. I am not at liberty to state the ingredients of "Terpeline," because its composition and the mode of compounding same is a trade-secret of Fireball Gas Tank & Illuminating Company, all my rights in and to said invention and trade-secret having become the property of said corporation.

The use of a liquid for holding a gas in solution for the purpose of storage and use, whether such gas be under pressure or not, is very old in the arts. I need refer only to the solution of ammonia gas

in water, constituting the well-known ammonia water of commerce, and the solution of hydrochloric acid gas in water, producing the hydrochloric or muriatic acid of the arts, both of which have been known for scores of years; to the solution of formaldehyde gas in water, which solution is commonly known as formalin and which has been known and in use for certainly twenty years; and to the solution under pressure of carbonic acid gas, both in water and in other fluids, constituting the well-known beverages, soda water, seltzer water, beer, champagne, etc., all of which have been well known in the arts for surely upwards of half a century.

Defendant's Exhibit Bottle of Seltzer Water is a sample of the above-mentioned beverage commonly known as seltzer water. The antiquity prior to 1894 of prepared packages of carbonated water is beyond question, said ante-1894 prepared packages consisting (as does, also, Defendant's Exhibit Bottle of Seltzer Water) of a closed vessel containing a supersaturated solution of gas (viz., carbonic acid gas) produced by forcing carbonic acid gas into a solvent (viz., water) under pressure, said vessel having an outlet for the carbonic acid gas when the pressure is released, and a cap valve for controlling said outlet whereby the gas and the solvent may escape therethrough in exactly the same manner as to uniformity of pressure as acetylene gas and the solvent escape from the "Prest-O-Lite" tanks of complainants and in exactly the same manner as to uniformity of pressure as the acetylene gas escapes from a "Fireball" gas tank, said ante-1894 siphons of seltzer water constituting, like Defendant's Exhibit Bottle of Seltzer Water, a prepared package consisting of a
174 tight shell or vessel; a solvent of a gas contained within said vessel; and gas dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a cap valve. An essential difference between the "Prest-O-Lite" and "Fireball" tanks on the one hand and the Claude & Hess patent No. 664,383 on the other hand is the fact that said patent absolutely requires a reducing-valve (a well known form of valve, only automatic in its action), while the "Prest-O-Lite" and "Fireball" tanks utilize a needle valve. With this distinction in mind, the well-known ante-1894 bottles of seltzer water constitute a complete anticipation of claims 1 and 2 of said Claude & Hess patent if said patent be so construed as not limited to a reducing-valve and infringed when a needle valve is used instead of a reducing-valve. This is evident from the foregoing analysis of Defendant's Exhibit Bottle of Seltzer Water and particularly so when it is remembered that water and alcohol and acetone were all known as solvents for acetylene gas long prior to the date of the application for the Claude & Hess patent No. 664,383 and that it was also known prior to the date of the application for the patent in suit that with acetylene gas under pressure same would form a supersaturated solution thereof. The receptacle or vessel and its controlling valve being old in the seltzer water siphon as above described and the solution of a gas in water being old, also, and the placing of a supersaturated solution of that gas in that solvent under pressure in that receptacle being old, too, and the

use of that same solvent for acetylene gas being in addition very well known and the use of alcohol as a solvent for acetylene gas having been known for a very long time and the availability of acetone as a solvent for acetylene gas therewith under pressure to form a supersaturated solution having been known, also, before the date of the application for the Claude & Hess patent No. 664,383 it can easily be seen that there was no invention in substituting for the supersaturated solution of one gas in one solvent in the old seltzer water siphon a supersaturated solution of a different gas in a different solvent.

Acetylene gas was discovered by E. Davy in 1836, and long prior to that time it was well known that a physical law exists that gases are soluble in liquids, by which expression is meant that a liquid will absorb a gas. The proportion of a certain gas that will be absorbed by a liquid depends upon the particular liquid used, as some liquids absorb a larger proportion of a certain gas than will be absorbed by other liquids. This, also, has been common knowledge for much more than half a century. During the same
175 period of time it has, also, been common knowledge that the proportion of gas that a liquid will absorb depends, also, upon the temperature and most especially upon the degree of pressure under which the absorption takes place. For seventy-five years it has been common knowledge that acetylene gas is readily soluble in water, and that water at normal temperature and pressure takes up about its own volume of acetylene gas. The following table will show the relative capacities of various liquids for absorbing acetylene gas:

Brine absorbs 5/100 of its own volume;
Water absorbs 1 1/10 of its own volume;
Alcohol absorbs six times its own volume;
Paraffin absorbs 1½ times its own volume;
Carbon disulphide absorbs its own volume;
Fusel oil absorbs its own volume;
Benzene absorbs four times its own volume;
Chloroform absorbs four times its own volume;
Acetic acid absorbs six times its own volume;
Acetone absorbs 22 to 25 times its own volume.

The new liquid compound referred to above called "Terpeline" and used by defendant as a solvent for acetylene gas possesses larger absorptive powers than any of the solvents named in the foregoing list. If at atmospheric pressure and a temperature of sixty-four (64) degrees Fahrenheit acetone will absorb 22 times its own volume of acetylene gas, at 12 atmospheres acetone will absorb 264 volumes of acetylene gas, due to the increased pressure. At atmospheric pressure and at a temperature of sixty-four degrees Fahrenheit "Terpeline" will absorb not less than 25½ times its own volume of acetylene gas, and at a pressure of 12 atmospheres "Terpeline" will absorb 306 times its own volume of acetylene gas.

Acetone when mixed with air is highly inflammable, but "Terpeline" under the same circumstances is not inflammable and is noncombustible. Hence, "Terpeline" is a much safer solvent than acetone.

The odor of acetone is pleasant and constantly the same. The odor of "Terpeline" varies from time to time, but is always unpleasant.

The specific gravity of acetone is stated by the Encyclopædia Britannica (eleventh edition) to be 0.819, but commercial acetone, as procurable in the market, has a specific gravity of 0.790. The specific gravity of "Terpeline" is 1.14.

Acetone is extremely volatile, and this coupled with its low specific gravity makes it objectionable as a solvent for acetylene gas in tanks for automobile headlights, because of its consequent characteristic of "blowing" with the gas when the gas is allowed to escape, as, for instance, when the lights are lit. This "blowing" of the acetone is objectionable to the user of acetylene tanks in which acetone is used as the solvent because such "blowing" of the acetone causes the unnecessary deposit of carbon on the burner tips of the lamps, with resultant clogging of the openings. "Terpeline," on the other hand, does not "blow" at all, due to the fact that it is more viscous than acetone and less volatile than acetone and because it possesses a higher specific gravity, which causes it to become more readily inmeshed by the porous filler (asbestos or the like) that is necessarily used in acetylene tanks in which acetylene gas is held in a solvent in a highly compressed state. Obviously the greater viscosity of "Terpeline" as compared to acetone results in same being held by the said porous filler from "blowing" and, likewise, from gravitating toward the bottom of the tank. By reason of these three properties of "Terpeline" by which it is distinguished from resemblance to acetone new and improved results are obtained, among which may be mentioned the elimination of carbon deposit at the burners, greater safety because the solvent fills the tank and thus holds the highly compressed acetylene gas in solution in all parts of the tank instead of, as when acetone is used, leaving a space at the top of the tank in which acetylene gas collects after escape from the solvent and the simplification of the structure of the tank, as shown by comparison of Defendant's Exhibits Nos. 1 and 2, since, when "Terpeline" is used, it is unnecessary to put the gas outlet at any particular place on the tank or to mark the tank "This side up," but said gas outlet when "Terpeline" is used as the solvent may be located anywhere. When acetone is used, however, the gas outlet must be located at a point above the level of the solvent, due to the greater volatility, less viscosity, and lower specific gravity of acetone as compared to "Terpeline." These results are graphically depicted in the drawings marked Defendant's Exhibits Nos. 1 and 2. In Defendant's Exhibit No. 1 acetone is denoted by the yellow part as having gravitated downward in the asbestos blocks until it occupies the lower part of the tank below the gas outlet *c* and leaving a space within the tank near the top in which acetylene gas collects after it escapes from the solvent, this body of acetylene gas being as dangerous from the explosive standpoint as if it had never been dissolved in the acetone denoted by the yellow in the lower part of the drawing. This acetone originally filled the porous blocks within the tank, but, by reason of its non-viscosity, by reason of its greater

176

fluidity, and by reason of its specific gravity, which renders
177 it less capable of adhesion to the porous material, has gravitated to the bottom of the tank. As shown by Defendant's Exhibit No. 2, "Terpeline" fills the entire tank, does not sink to the bottom thereof, and, as before stated, does not "blow," the reasons for its not "blowing" and the reasons for its not sinking to the bottom of the tank and leaving a collection of free acetylene gas at the top being the same, namely, its more viscous nature as compared to acetone, its less degree of volatility as compared to the same, and its higher specific gravity.

In actual practice in refilling the "Fireball" tanks of defendant, it has been found to be a fact that there is no appreciable diminution of the "Terpeline" with which same are originally charged. Of course, as "Terpeline" is a liquid, it is obvious that, in the course of events, some slight evaporation will necessarily occur, although that will be at a minimum, because of the non-access of the air to said "Terpeline." The retention of the "Terpeline" within said "Fireball" tanks that has been found to exist in actual use is, however, conclusive proof that "Terpeline" does not "blow." This is due to its essentially different nature from acetone, as hereinabove set forth.

The commercial success of the "Prest-O-Lite" tanks has undoubtedly been due not to any resemblance that they may be supposed to possess to the apparatus of the Claude & Hess patent No. 664,383, but to their embodiment of the matter described in the Fouché patent, No. 727,609, dated May 12, 1903. The article on "Acetylene" in the eleventh edition of the Encyclopædia Britannica states that at first it seemed that the application to acetylene in commercial use of the principle of its solubility in liquids, including acetone, "would do away with all the troubles connected with the storage of acetylene under pressure, but it was soon found that there were serious difficulties still to be overcome." Said article in the Encyclopædia Britannica continues as follows: "The chief trouble was that acetone expands a small percentage of its own volume while it is absorbing acetylene; therefore it is impossible to fill a cylinder with acetone and then force in acetylene, and still more impracticable only partly to fill the cylinder with acetone, as in that case the space above the liquid would be filled with acetylene under high pressure, and would have all the disadvantages of a cylinder containing compressed acetylene only. This difficulty was overcome by first filling the cylinder with porous briquettes and then soaking them with a fixed percentage of acetone, so that after allowing for the space
taken up by the bricks the quantity of acetone soaked into
178 the brick will absorb ten times the normal volume of the cylinder in acetylene for every atmosphere of pressure to which the gas is subjected, whilst all danger of explosion is eliminated. This fact having been fully demonstrated, acetylene dissolved in this way was exempted from the Explosives Act, and consequently upon this exemption a large business has grown up in the preparation and use of dissolved acetylene for lighting motor omnibuses, motor cars, railway carriages, lighthouses, buoys, yachts, etc., for which it is particularly adapted."

In the issue of May 6, 1911, of the "Scientific American," an article states that in putting the theory of the absorption of acetylene gas in acetone as described in the Claude & Hess patent No. 664,383 into practical use Claude & Hess partially filled the cylinders "with acetone and then forced the gas in under a pressure of about twelve atmospheres," said article, which is found at page 453 of Volume CIV., continuing as follows: "At this pressure and at ordinary temperature, the acetone will absorb about 300 times its own volume of the gas. When the valve is opened the pressure is reduced and the surplus gas passes off to the point of use, such as a burner, leaving the acetone unaltered and capable of taking up a fresh charge of gas. In all cases where acetone is used, the valve must be kept at the top to prevent its escape. No trouble, however, would result should it get mixed with the gas, since it itself is inflammable. The gas stored in this way is safe against explosion so long as the cylinder is full, but this process is open to one serious objection. Acetone increases in volume when it absorbs the gas. A cylinder having only forty-seven per cent of its volume filled with acetone at the beginning will be entirely filled with liquid when fully charged with the gas, and when the gas is escaping it shrinks, so that a cylinder which has been in use for some time will have a space at the top filled with gas under a dangerous pressure. Under a pressure of ten atmospheres (150 pounds) the presence of the acetone is an element of safety, for the acetylene dissolved therein does not explode, but should the pressure be over twenty atmospheres (300 pounds) it does explode and adds its heat of combustion to that evolved by the acetylene. While this process greatly reduced the chances of explosion, still the use of acetone alone was too dangerous to make the process a commercial success. A few years later, Edmund Fouché, of Paris, added the final element which made compressed acetylene a commercial possibility. He first placed in the cylinder a filler of some inert porous substance, such as asbestos, infusorial earth, or charcoal, etc., and then added the acetone
179 in which the gas was absorbed as before. In this way he prevented the existence of any considerable volume of compressed gas at any one point. In the illustration is shown one form of filler now in use. It consists of disks of asbestos entirely filling the cylinder. This filler decreases the gas-holding capacity about twenty per cent., but its addition renders the gas entirely safe against explosion. In practice, these cylinders charged under ten atmospheres will hold about 100 volumes of the gas measured at atmospheric pressure. A platinum wire passing through the cylinder and heated electrically to a white heat has no other effect than to decompose the gas in immediate contact with it, for the porous filler effectually prevents the further spread of the explosive wave. The porous filler alone, when composed of charcoal, forms a perfectly safe medium for the storage of the compressed gas if the pressure does not exceed seven atmospheres. At this pressure, according to Capelle, a cylinder of one liter capacity will hold eight to nine liters of acetylene measured at atmospheric pressure. This is a cheap method

and may be used advantageously where a large reserve supply is not needed. When the cylinders are exhausted they are usually sent to some central charging station. Here acetylene from the generator, after being purified, is compressed generally in two stages, carefully cooled and then forced into large storage tanks which also contain a porous filler and acetone. The exhausted cylinders are connected up and charged directly from these tanks."

A copy of said "Scientific American" is filed herewith and marked Defendant's Exhibit "Scientific American" of May 6, 1911.

I thoroughly understand the Claude & Hess patent No. 664,383, and, therefore, state that the specification, drawings, and claims of this patent each and all clearly show that it is limited as to its valve control of the outflow of the gas to the use of a reducing-valve. Each and every one of its claims is so limited. In regard to this feature there is no difference between claim 1 and the other claims, although the term "reducing-valve" is not found in claim 1. The final element in claim 1 expressed by the language "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" means a reducing-valve and nothing else. Anything that is describable by the language just quoted is a reducing-valve. To this language the claim subjoins the words "substantially as described," which clearly leads one to the specification and drawings of the patent to find out what kind of
180 means is meant by the phrase in the claim "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." The specification and drawings when thus consulted interpret this phrase in claim 1 of the Claude & Hess patent as meaning the reducing valve *d* which the specification (page 1, line 92 et seq.) says is used "in order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure." The specification in the same context continues that the reducing-valve *d* may be of any suitable or usual construction, but the use of some form of reducing-valve is absolutely required by the specification and claims of this patent, the reason why a reducing-valve is required being stated in lines 13 to 20 on page 2 of the patent, where the following statement is made: "It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted." Not every valve is a reducing-valve. A needle valve is not a reducing-valve. Neither is a flap valve or a ball valve. The term "reducing-valve" absolutely means a certain kind of valve, and is not a term loosely used to mean any kind of valve. Just as the term "fountain pen" means a particular kind of pen, the essential functions and features of the construction of which are familiar to every one, so the term "reducing-valve" means a particular kind of construction having certain definite functions. Just as the term "fountain pen" means a certain definite kind of construction notwithstanding that the form of particular construction may be infinitely varied, so the term "reducing-

valve" indicates a certain definite construction having well known functions notwithstanding the fact that the form of the particular details of construction may be varied. A reducing-valve is always an automatically acting device, while a needle valve is a non-automatic device. A needle valve is a mere stopper for a hole. When applied to a gas tank a needle valve used to plug the gas outlet, as, for instance, in Defendant's Exhibit "Fireball" Tank and Defendant's Exhibit "Prest-O-Lite" Tank and Defendant's Exhibit Sectioned "Fireball" Tank and Defendant's Exhibit Sectioned "Prest-O-Lite" Tank, simply regulates the quantity of gas allowed to flow out of the tank. If opened only a little, it permits but a small quantity of the gas to escape. If opened wider, it permits a larger quantity of gas to escape. It does not at all regulate the gas
181 pressure, but only the quantity of flow. On the other hand, a reducing-valve might also be called an equalizing valve, because its function is to maintain the pressure of the gas equal on the discharge side of the reducing-valve regardless of the fact that the pressure of the gas on the reservoir side may have become diminished. It does this by automatic action and produces the result that the pressure of the gas at the burners is substantially the same when the tank is nearly empty as when it is full, differing thus in a widely different manner in the result produced by the needle valve of the "Prest-O-Lite" and "Fireball" tanks, in the use of both of which the pressure of the gas at the burners constantly decreases and is at the end comparatively feeble, though very strong when said tanks are full.

No reducing-valve is found in either the "Fireball" or the "Prest-O-Lite" tank, but a needle valve is the means in each for the control of the gas outlet, said needle valve being, like all other needle valves, non-automatic in its action and not capable of producing a substantially uniform pressure of the gas in its escape and not capable of so regulating the pressure of the gas at the outlet from the tank that said pressure will be substantially the same when the receptacle is fully charged as when it is nearly exhausted.

I further state that "Terpeline" possesses other advantages over acetone as a solvent for acetylene gas in addition to those mentioned above, among which additional advantages the following may be stated: When acetylene gas is being absorbed by "Terpeline" under pressure, much less heat is developed in the tank than when acetone is used as a solvent. Consequently, with "Terpeline" as a solvent, the tank can be charged with a greater volume of gas at less pressure. When acetylene gas is liberated from "Terpeline," it gives a much whiter flame and higher candlepower than when liberated from acetone. It seems that the acetylene gas undergoes some chemical change while stored in the "Terpeline," giving this brighter light which is absent when the gas is stored in acetone.

I have demonstrated by a long line of experiments with various artificial lights that the light from acetylene gas obtained from calcium carbide and water gives a light that is the nearest approach to daylight, but was still somewhat short on the blue and violet rays of the spectrum and over some on the red and orange rays. The light

given by acetylene gas liberated from "Terpeline" seems to be an improvement on this, and hence of all the artificial lights comes nearest to daylight in quality.

182 I have examined Defendant's Exhibit Sectioned "Prest-O-Lite" Tank, and state that the valve therein is a needle valve. I have examined, also, Defendant's Exhibit Sectioned "Fireball" Tank, and state that the valve therein is a needle valve. I have examined Defendant's Exhibit Opened "Prest-O-Lite" Tank, and find that the valve therein is the same as that in Defendant's Exhibit Sectioned "Prest-O-Lite" Tank and is a needle valve. I have examined Defendant's Exhibit "Fireball" Tank, and find that the valve therein is the same as that in Defendant's Exhibit Sectioned "Fireball" Tank, and that said valve is a needle valve. I have examined Defendant's Exhibit Nitrous Oxide Tank, and find that the valve therein is a needle valve and that the construction of said tank, in addition to said valve, more closely resembles defendant's "Fireball" tanks than said "Fireball" tanks resemble the Claude & Hess patent, No. 664,383, as regards either its claims, specification, or drawings. I have examined Defendant's Exhibit Rosso Gas Tank, and find that same is identical with the "Prest-O-Lite" tanks on the market, illustrated by Defendant's Exhibit Opened "Prest-O-Lite" Tank, the only difference being of immaterial character, such as differences in size, material, color, and the like, the valve and pipe arrangement being identical. I have known of the use of tanks exactly like the Rosso gas tank for containing gas under high pressure, supplying same for stereopticon exhibitions as early as 1894 and even earlier and continuously ever since.

The entire inside of the "Fireball" tanks is coated with a mixture of tin and lead, making a sheath that completely separates the contents of the tank from the brass shell. If there were any danger from the contact of acetylene gas with brass, same would be obviated by this interior lining of the "Fireball" tanks. As a matter of fact, the highest authorities agree that there is no danger from contact of acetylene gas with brass or other alloys of copper or with copper. For instance, the eleventh edition of the Encyclopædia Britannica in its article entitled "Acetylene," Volume I., page 137, said article having been written by the Professor of Chemistry in the Royal Naval College, Vivian Byam Lewes, F. I. C., F. C. S., who is, also, Chief Superintendent Gas Examiner to the Corporation of the City of London, contains the following: "When acetylene was first introduced on a commercial scale grave fears were entertained as to its safety, it being represented that it had the power of combining with certain metals, more especially copper and silver, to form acetylides of a highly explosive character, and that even with coal gas, which contains less than 1%, such copper compounds had been

183 known to be formed in cases where the gas-distributing mains were composed of copper, and that accidents had happened from this cause. It was therefore predicted that the introduction of acetylene on a large scale would be followed by numerous accidents unless copper and its alloys were rigidly excluded from contact with the gas. These fears, have, however, fortunately proved to be un-

founded, and ordinary gas fittings can be used with perfect safety with this gas."

"Fireball" gas tanks are much safer than "Prest-O-Lite" tanks for the reason, among others, that the solvent, "Terpeline," used in the "Fireball" tanks is non-inflammable, while the solvent, acetone, used in the "Prest-O-Lite" tanks is highly inflammable. Moreover, the tin and lead coating on the interior of the "Fireball" tanks covers every brass part thereof, while the brass valve ends and the like of the "Prest-O-Lite" tanks extend to the interior thereof and into direct contact with the acetylene gas without the safeguard of such tin and lead coating.

(Signed) HERMAN H. BORN.

Sworn to and subscribed before me this 18th day of August, 1911. My commission expires January 22, 1915.

[SEAL.] (Signed) NANCY C. THOMAS,
Notary Public.

184 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Angelo Rosso, being duly sworn, on his oath deposes and says as follows:

I reside in the City of St. Louis, State of Missouri; I am 44 years of age; my place of business is located at 516 Elm Street and I do business under the name of St. Louis Calcium Light Company; I am, and for the last 25 years have been, engaged in the manufacture of oxygen gas and compression of various kinds of gas, including oxygen, hydrogen, etc., and, particularly, such gases as are used for stereopticons, and the like. These gases so manufactured by me are customarily introduced into cylindrical tanks under very high pressure, and, in these receptacles, are shipped to various parts of the country. Of my own knowledge, I am able to state that during all of the last 25 years packages of highly compressed gas of various kinds have been manufactured, sold, and extensively distributed by me in the ordinary course of my business of manufacturing and selling gas as aforesaid, said packages consisting of tanks like the one filed herewith marked "Defendants' Exhibit Rosso Gas Tank" and having thereon exactly the same kind of valve found in said exhibit and being filled with highly compressed gas of various kinds, the

valve of said tank being used, and intended to be used, for the control of the outlet of gas from said prepared package, consisting of said tank and the highly compressed gas contained within same.

185 Said valve is a needle valve and is the same kind of valve that is very common in many uses, including various kinds of gas tanks for the control of the flow of gas. Affiant further states that gas tanks and gas packages of the kind hereinbefore described by him, consisting of tanks like Defendants' Exhibit Rosso Gas Tank, filled with highly compressed gas, were sold in large numbers as long as 25 years since and continuously every year since then. Ever since the commercial introduction of acetylene gas for lighting and brazing purposes, tanks of highly compressed acetylene gas as well as other kinds of gas, the tanks being of the exact construction shown in the exhibit marked "Defendants' Exhibit Rosso Gas Tank", have been sold and well known.

(Signed) ANGELO ROSSO.

Sworn to and subscribed before me this 18th day of August, 1911.
My term expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

186 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Alfred Ramel, being duly sworn, on his oath states that he is a resident of the City of St. Louis, State of Missouri, and that he is secretary and treasurer of Security Envelope & Fastener Company, the place of business of which is located at 634 South Seventh St., in that city; that until recently he was employed as a statistician by the Missouri Pacific Railway Company; that in the year 1892 and prior thereto and subsequent thereto, in all comprising a period of fifteen years, he was an employee of Washington University, of St. Louis, Missouri, being the assistant in charge of the clock department of that university under Professor Henry S. Pritchett, professor of mathematics and officially in charge of that department. Affiant further states that during the years when he was employed by Washington University as aforesaid and definitely in the year 1892 and before and in the years 1893 and 1894 he operated the stereopticon for illustrations of numerous lectures delivered to the

public under the auspices of said University in those years, and he further operated the stereopticon on sundry other occasions unconnected with said University in the year 1892 and before and after that date.

Affiant states that in the years 1892, 1893, 1894, and prior to 1892 he many times bought and used in such stereopticon exhibitions as aforesaid tanks of highly compressed gas, the tanks
187 being of exactly the same construction as the tank produced in this cause marked Defendant's Exhibit Rosso Gas Tank. Affiant further states that such gas tanks were used by him as aforesaid in the years mentioned in considerable numbers and that same were then and now are and since prior to 1892 continuously have been a staple article of commerce, being purchasable in 1892 and prior thereto and ever since and now as prepared packages of highly compressed gas, large numbers of which have been used generally in every year since prior to 1892.

Affiant further states that the construction of said tank is the same as that of the "Prest-O-Lite" tank in evidence in this cause as Defendant's Exhibit Sectioned "Prest-O-Lite" tank, said tanks differing only in size, both having a needle valve for the control of the outflow of the highly compressed gas contained therein.

(Signed) ALFRED RAMEL.

Sworn to and subscribed before me this 23d day of August, 1911. My commission expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

188 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

William M. Lohse, being duly sworn, on his oath states that he is a practical mechanic and automobile expert and that he has been engaged in the automobile business since 1902 in New York, St. Louis, and elsewhere, and is thoroughly conversant with all branches of the industry, including the manufacture, repair, and use of machines and other accessories.

Affiant further states that the first "Prest-O-Lite" tanks for supplying acetylene gas to the headlights of automobiles were introduced on the market in New York City in the fall of 1905, and that he has

known and seen and used "Prest-O-Lite" tanks ever since and is well acquainted with their construction, all of same containing asbestos or other porous filler that absorbs the acetone in which the acetylene gas is held in solution. He states that without such porous filler, the "Prest-O-Lite" tank would be highly dangerous, containing, as it does, acetylene gas under high pressure merely dissolved in acetone. Affiant states that the safety of said tanks is due to said porous filler. Affiant states that he has examined a large number of opened "Prest-O-Lite" tanks, and that every one thus examined by him contained said porous filler.

Affiant furthermore states that he is well acquainted with the distinction between reducing-valves and needle valves, and that they perform respectively entirely different functions. A needle
189 valve merely closes an outlet when closed, and removes the closing of that outlet when open. It is operated only by hand, or the like, and is always non-automatic in character. It seats on a valve-seat and non-automatically is moved toward said seat or away therefrom, thus either closing the outlet that it controls or opening it. When the flow of gas under pressure is controlled by a needle valve, the pressure of that gas necessarily diminishes as the gas escapes. A reducing valve, however, is an automatic device, which so controls the flow of gas by reason of the automatic action of the reducing-valve that, although the quantity and pressure of the gas in the reservoir has been greatly diminished, the pressure of the gas on the discharge side of the reducing-valve will, nevertheless, remain the same. It is impossible to produce such a result with a needle valve. The valves in both "Prest-O-Lite" and "Fireball" tanks are mere needle valves and not reducing-valves, and there is no reducing-valve in either the "Prest-O-Lite" or "Fireball" tanks. The gas outlet in each is controlled by a needle valve. Except that each device is called a valve, there is not the slightest resemblance between a needle valve and a reducing-valve, and no more resemblance than, because each is called a car, there is between an automobile and a street-car.

(Signed) WILLIAM M. LOHSE.

Sworn to and subscribed before me, this 1st day of September, 1911.

My commission expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

190 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Orville Sprecher, of lawful age, being duly sworn, deposes and says as follows:

I am a resident of Milwaukee, Wisconsin, and from June, 1906, to June, 1907, was vice-president of The Prest-O-Lite Company, an Indiana corporation, one of the complainants in this cause. I was employed by that company from the time when said corporation was first formed, and part of my duties with that corporation was to superintend the filling and refilling of "Prest-O-Lite" tanks with acetylene gas and acetone. I have since sold all my stock in The Prest-O-Lite Company and have no interest in the present controversy. I am, however, particularly familiar with matters pertaining to acetylene gas, receptacles therefor, tanks to contain same, valves for the control of same, solutions therefor, and I am especially familiar with such matters relative to tanks of acetylene gas for automobile headlights.

When automobiles first came into use, it was found that such a rapidly moving vehicle required more powerful lights than the ordinary oil lamps carried by buggies, carriages, and the like, and that these more powerful lights needed to be in the nature of a headlight to illumine the road for the driver, like the headlight of a locomotive engine. Acetylene gas furnished the light most like sunlight of any artificial light and recourse was naturally had to it.

191 The first acetylene headlights for automobiles were supplied with such gas from an acetylene gas generator mounted upon an automobile. Carbide would be placed in a cup and water in a superimposed cup, and, when light was desired, a valve would be opened to allow the water to flow upon the carbide and thus to generate acetylene gas. This mode of supplying gas to the headlights was cumbersome, inconvenient, and objectionable for many other reasons.

Some of the organizers of The Prest-O-Lite Company had heard of certain acetylene gas packages utilized in Europe for furnishing gas to automobile headlights, said gas packages being constructed in the same manner as those described and illustrated in the Fouché United States patent, No. 727,609, dated May 12, 1903, and found out, also, about the existence of said Fouché patent, No. 727,609, and

that the ownership of it was vested in persons who were succeeded in title by Commercial Acetylene Company, of the City of New York, a New Jersey corporation, one of the complainants in the present suit, the title to the Claude & Hess patent, No. 664,383, being held by the same parties. It having been represented to The Prest-O-Lite Company, then known as Concentrated Acetylene Company, that said Claude & Hess patent dominated said Fouché patent, The Prest-O-Lite Company entered into a contract with Commercial Acetylene Company for a license under both patents and some others, which were supposed more or less to relate to subject-matter adaptable for use for automobile lighting purposes. The specification and drawings of the Claude & Hess patent, No. 664,383, show that it is for a houselighting system, while another of the patents to which said contract relates was No. 619,552, dated February 14, 1899, granted to Fouché, for Means for Localizing Explosions in Gas Mains.

At the time The Prest-O-Lite Company negotiated for license under said Fouché patent, No. 727,609, and others, it was known and understood that the apparatus and device of said Claude & Hess patent, No. 664,383, involved serious difficulties attending the storage of acetylene gas when same is dissolved in acetone under pressure, which would make the use of the apparatus disclosed by the Claude & Hess patent, No. 664,383, inoperative and dangerous and commercially worthless without the addition of the porous filler for the tank described in said Fouché patent, No. 727,609. In the first place, the provision at the top of the tank shown in the Claude & Hess patent No. 664,383, of a chamber for acetylene gas freed from the solvent in the lower chamber makes provision for a body of free acetylene as dangerous having escaped from the solvent as if
192 it had never been dissolved therein. In the second place, acetone expands a small percentage of its own volume while it is absorbing acetylene. Therefore, it is impossible to fill a tank with acetone and then force in acetylene, and still more impracticable only partly to fill the tank with acetone, as in that case the space above the liquid will be filled with acetylene under high pressure, thus having all the disadvantages of a tank containing compressed acetylene only. This difficulty was first overcome by the use of the means described in said Fouché patent, No. 727,609, namely, by first filling the tank with porous briquettes and then soaking them with a fixed percentage of acetone, so that after allowing for the space taken up by the bricks of asbestos the quantity of acetone soaked in the brick will absorb ten times the normal volume of the tank in acetylene gas for every atmosphere of pressure to which the gas is subjected, whilst all danger of explosion is eliminated.

Although the invention of said Fouché patent was commercially valuable and is the thing that made the commercial success of The Prest-O-Lite Company possible in the sale of the "Prest-O-Lite" tanks involved in the present case, yet the record in the case of Commercial Acetylene Company v. Avery Portable Lighting Company, 166 Federal Reporter, page 907, was such as to show its invalidity because of anticipation, and as stated by Judge Quarles in his opinion in that case at page 908 of 166 Federal Reporter: "Upon the final hearing

complainant withdrew its contention as to the Fouché patent, so that the issues in the case are limited to the Claude & Hess patent."

The defendant in the case just mentioned did not put before the court any prior patents or publications to show anticipation or limitation of the Claude & Hess patent, No. 664,383, although it did cite in its answer in that case prior patents and publications tending in that direction, but rested its defense solely upon the limitations expressed in the claims of said Claude & Hess patent to a reducing-valve and the fact that the defendant in that case, Avery Portable Lighting Company, used a needle valve, its defense consisting only of an attempt to show non-infringement by reason of its use of a needle valve instead of the reducing-valve called for by the claims of the Claude & Hess patent, No. 664,383.

I have had extensive opportunities for becoming familiar with various mechanical appliances, including a large number of different kinds of valves, and I know the difference that people familiar with valves and mechanical terms understand to exist between a reducing-valve and other valves. The term "reducing-valve" means
193 one certain kind of valve, although the forms of that kind of valves are various. However, every reducing-valve is an automatically operating valve for regulating gas pressure and is, therefore, frequently called also by the name "pressure-regulator." A reducing-valve is a device susceptible of change of form, but whether complex or simple in construction or whether made up in few or many parts and no matter how varied in form it may be, it is always recognized by that name and always consists of a device which automatically governs the flow of gas from one side of said valve to the other. In other words, with a body of gas under pressure on one side of the valve and pipes on the other side leading to burners, the pressure at the burners will decrease when the amount of gas on the burner side of the reducing-valve becomes diminished. When this decrease of pressure on the burner side of the valve occurs, the reducing-valve automatically opens long enough to allow enough gas to pass therethrough to restore the former pressure at the burners by resupplying the quantity of gas on that side of the reducing-valve. When this equalization in pressure has been effected, the reducing valve automatically closes and remains closed until decrease of quantity of gas and pressure on the burner side of the valve again causes it automatically to open. A device which does not possess this function of automatically opening and closing, in order to maintain an adequate supply and pressure of gas on the burner side of the valve, is not a reducing-valve, and is not, and can not be, the mechanical equivalent therefor, and is not such a device as that in claim 1 of the Claude & Hess patent, No. 664,383, called "means for controlling" the gas "outlet whereby the gas may escape therethrough at substantially uniform pressure." These words, while apparently somewhat broader in scope than the term "reducing-valve," mean, and can only mean, a reducing-valve. Neither those words quoted from claim 1 of the Claude & Hess patent nor the term "reducing-valve" found in other claims of that patent can possibly mean a needle valve, nor can a needle valve be the mechanical equivalent for a reducing-valve

or for the means referred to in the language just quoted from claim 1 of said Claude & Hess patent. The means thus referred to in claim 1 of the Claude & Hess patent are for the purpose stated in lines 18 to 20 of page 2 of that patent, namely, for the purpose that "the pressure" shall be "substantially the same when the receptacle is fully charged as when it is nearly exhausted." This is not the case when a needle valve is used, but the result of using a needle valve is that the pressure of gas gradually d-creases and is utterly unlike when the tank is nearly exhausted the condition when the recep-
194 tacle is fully charged. When the tank is full, the pressure is very strong and the gas rushes out with much force and a loud noise. The pressure gradually decreases when a needle valve is used and is exceedingly feeble and the emission of gas noiseless when the tank is nearly empty, it being understood in this comparison that the needle valve is open the same degree in both instances.

The "Prest-O-Lite" tanks have always been manufactured and sold by complainant, The Prest-O-Lite Company, with needle valves, and never with reducing-valves, and they have always been manufactured filled with the porous filler, and never without it. It was the porous filler that made the commercial success of the "Prest-O-Lite" tank.

The "Fireball" gas tanks of defendants employ a needle valve and not a reducing-valve or any other automatic means for controlling the gas outlet. The needle valve of defendants' "Fireball" tanks is an improvement over the ordinary needle valve, but may, otherwise, be described as a common needle valve. The arrangement of the needle valve of the "Fireball" tank is such as to afford ease of attachment of a "Fireball" tank to an automobile, without the use of tools, and in this respect it differs from the "Prest-O-Lite" tanks. Moreover, it can be operated by the automobile user without a wrench, its valve being opened and closed by a simple hand-wheel.

The first "Prest-O-Lyte" tanks that were put on the market by The Prest-O-Lite Company had the gas outlet located about the center of the end of the tank, but this was found to be objectionable because the acetone would "blow" out of the tank with the acetylene gas, and it was found necessary to locate the gas outlet above the level of the solvent, that is to say, as near the top of the tank as possible; and since the first twenty or twenty-five "Prest-O-Lite" tanks were manufactured all others have been constructed with the gas outlet near the top of the tank for the reason stated. I am familiar with the construction of the "Fireball" tank, and in contradistinction to the construction of the "Prest-O-Lite" tank the "Fireball" tank has its gas outlet, not at the top of the tank nor above the level of the solvent nor at any other specified point, but merely in the center of the end of the tank.

(Signed) ORVILLE SPRECHER.

Sworn to and subscribed before me this 21st day of August, 1911. My commission expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

195 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

George G. Little, being duly sworn, on his oath deposes and says as follows:

My residence is at the City of St. Louis, State of Missouri, and I am forty years of age. I was chief designer for the Universal Adding Machine Company, of St. Louis, Missouri, and foreman for seven years. I was chief mechanical designer for The Duplex Adding Machine Company, of St. Louis, Missouri, for two years. For one year I was designer for the Burroughs Adding Machine Company, then located in St. Louis, Missouri. Between my employment by said Burroughs Adding Machine Company and my employment with Universal Adding Machine Company I was for three years chief mechanical engineer for American Radiator Company, of St. Louis, Missouri. I am now and for one year last past have been employed as mechanical engineer for the Diagraph Company, of St. Louis, Missouri, manufacturers of a stencil-cutting machine.

Due to my education and constant employment for many years as a mechanical engineer I am familiar with the various kinds of valves. The commonest kind of valve is the needle valve, which is a hand-operated non-automatic plug to stop a hole, it being usually externally threaded so as to be moveable by revolution toward or away from the hole that it controls. For very many years
196 long prior to 1894 needle valves attached to tanks and controlling the outlet therefrom have been used to control the flow of gas contained within such tanks in a highly compressed state, an example of such use being found in Defendant's Exhibit Rosso Gas Tank filed as an exhibit in this cause. Said exhibit is in all respects the same as the "Prest-O-Lite" tanks as exemplified in Defendant's Exhibit Sectioned "Prest-O-Lite" Tank and has a needle valve just like that of the "Prest-O-Lite" tank.

I am familiar with the internal and external construction of the "Prest-O-Lite" tanks, and am able to state that none of the "Prest-O-Lite" tanks contains a reducing-valve nor has a reducing-valve in connection therewith. Their only valve is a needle valve. Said "Prest-O-Lite" valve is a non-automatic and manually operated valve. Said "Prest-O-Lite" needle valve is not a reducing-valve, and it would be a gross perversion of the truth to call it a reducing-valve or to say that it possesses the functions that belong to a reducing-valve. It is

not a mechanical equivalent for a reducing-valve, as it in no wise resembles a reducing-valve. A reducing-valve, is a device which acts automatically to maintain uniformity of pressure, as, for instance, of gas. All that a needle valve does is to open a hole, as, for instance, in a "Prest-O-Lite" tank, and thus allow the gas to escape so long as that hole remains open. The result is that there will be a gradual decrease of pressure at the outlet because the less of the highly compressed gas that remains within the tank the less will be the remaining pressure. On the other hand, a reducing-valve is constructed and intended and operates to regulate the outflow of the gas in such manner that it will be substantially the same when the tank is nearly empty as when it is nearly full. This function is performed by a reducing-valve because of its peculiar construction, which construction characterizes a reducing-valve and thoroughly differentiates it from a needle valve. A needle valve is more or less like the mere cork stopper for a bottle. It merely closes the aperture. On the other hand, a reducing valve is a more or less complicated structure consisting of a plurality of parts and does much more than merely close the gas outlet. Instead of merely controlling the flow it, also, governs the pressure, due to its peculiar construction. The structure and the functions of a needle valve and of a reducing-valve are utterly unlike, and there is no point of resemblance.

It would be a transparent fallacy if not a falsehood to say that a needle valve is a reducing-valve because by allowing some of the gas to escape the pressure remaining in the tanks becomes less.
197 This would be like saying that feathers dispel darkness because they are light. It is a physical law that if part of the gas in a tank filled with highly compressed gas escapes the pressure of the gas remaining in the tank will not be so great as it was before part of the gas flowed out. This is obvious; but a plug for a hole in the tank does not become a reducing-valve merely because the contents and therefore the pressure of the gas remaining in the tank is reduced or decreased. If that were true, the needle valve might just as well be called a decreasing valve as a reducing-valve. There is, however, no valve known to the arts known as a decreasing valve, and a needle valve does not by the circumstances mentioned become a reducing-valve.

I am familiar with the construction of the "Fireball" gas tanks, and know that same are like the exhibit marked Defendant's Exhibit Sectioned "Fireball" Tank. They possess a needle valve, as shown in that exhibit and in Lukens patent No. 987,000 and in the drawing marked Defendant's Exhibit No. 2, and do not possess a reducing-valve, but are in all respects made as shown in Defendant's Exhibit Sectioned "Fireball" Tank and in said Lukens patent No. 987,000 and in said drawing Defendant's Exhibit No. 2.

(Signed) GEORGE G. LITTLE.

Sworn to and subscribed before me this 19th day of August, 1911.
My commission expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

198 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK AND ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

August Seim, of lawful age, being duly sworn, deposes and says as follows:

I am, and for the last five years have been, manufacturing superintendent for Missouri Lamp & Manufacturing Company, the place of business of which is located at 114 and 116 Elm Street, St. Louis, Missouri. Prior to my said connection with said company, I was for ten years in the sheet-metal business in my own name, and have had varied experience with the manufacture and use of mechanical appliances of different kinds, among which may be mentioned the manufacture of gas stoves, tanks of various kinds, etc. I am, also, familiar with the various kinds of valves that for the last twenty years have been in use for the control of the flow of gas and liquids.

I am familiar with the "Prest-O-Lite" tanks of complainants and the "Fireball" tank of the Fireball Gas Tank & Illuminating Company and thoroughly understand all the construction of each, and I am, therefore, able to state that neither of these tanks employs a reducing-valve as part of its construction nor any equivalent for a reducing-valve. Each of these tanks uses a common needle valve to control the escape of the acetylene gas therefrom. The needle valve of the "Fireball" tank is of improved construction as compared to the needle valve of the "Prest-O-Lite" tank and as compared to needle valves commonly in use.

199 A reducing-valve is a valve that is automatic in its regulation of gas pressure at the burners. It accomplishes this by automatically controlling the amount of gas in a chamber on that side of the valve nearer the burners. It operates by allowing a quantity of gas to pass through it from time to time from the main reservoir or container or receiver for the gas to said chamber nearer the burners. In other words, when the chamber nearer the burners becomes more or less empty, so that the pressure of the gas at the burners will be noticeably diminished, the reducing-valve without handling or manual operation automatically opens and permits the flow of a quantity of gas through it to the burner side of said valve. This restores the amount of pressure of the gas at the burners, although the amount of pressure remaining in the reservoir is constantly

lessened by the reduction of the quantity of gas therein, the chamber nearer the burners being smaller than the reservoir. The effect of using a reducing-valve and the object intended in using a reducing-valve is to deliver the gas at the burners at the same pressure whether the main reservoir is full or nearly empty. This effect can not be produced by a needle valve, but the use of a needle valve to control the escape of gas, as, for instance, from the "Prest-O-Lite" and "Fireball" tanks is to allow the pressure of the gas at the burners gradually to decrease as the amount of gas in said tanks diminishes.

While acetylene gas is more explosive than some other kinds of gas, and, for that reason, is in both complainants' and defendants' tanks separated into small quantities by being held within a porous material within the tank, such, for instance, as asbestos, yet the principles governing its flow to the burners and the mechanical means for controlling its emission are the same as those pertaining to any other kind of gas, as, for instance, the gas that forms the motive power in gas engines and the gas that is generated and used in gasoline stoves, plumbers' torches, and the like, and other kinds of gases. For very many years preceding 1894, both reducing-valves and needle valves have been well known in the arts as mechanical appliances for controlling the outlet of gas. I produce, herewith, as an example of the use of a needle valve to control the flow of gas to a burner, a plumber's torch, in which the gas generated from the gasoline contained in the tank is allowed to flow to the burner by the opening of the needle valve with the handle, or the supply of said gas to said burner is cut off by similar operation of the needle valve. The gas is formed of the combination of the liquid within the tank and air, and its out-flow is governed by the needle valve, which is manipulated either to open or close the gas outlet by the handle. The needle valve for controlling the flow of gas in this device is identical with the needle valve found in the "Prest-O-Lite" tanks, and, except for the improvements in needle valves found in the "Fireball" tank, is identical with the needle valve in the "Fireball" tanks. Plumbers' torches, like the one I produce herewith, which is marked "Defendants' Exhibit Plumber's Torch," have, to my own knowledge, been in common use by plumbers and other metal workers requiring such a device for more than twenty years last past and during all of that period of time. This device shows all of the constructional elements of claim one of the Claude & Hess patent, No. 664,383, dated December 25, 1900, except "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." Of course, if a needle valve were held to be the mechanical equivalent for a reducing-valve, then all of the structural elements of claims one, two, and five of said Claude & Hess patent would be found present in this plumber's torch. A needle valve cannot be the mechanical equivalent for a reducing-valve nor for "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" for two reasons: (1) because of not operating automatically and (2) because of its allowing the pressure at the burners gradually to decrease instead of remaining the same when the receptacle

is nearly exhausted as when it is fully charged. Nothing can be the mechanical equivalent for the reducing-valve of said Claude & Hess patent or for the means mentioned in claim one thereof for providing uniform gas pressure that does not operate automatically. The valve in neither the "Prest-O-Lite" nor "Fireball" tanks is automatic, and each allows the pressure of the gas at the burners gradually to decrease, so that the pressure of the gas in both complainants' and defendants' tanks is not substantially the same when the receptacle is fully charged as when it is nearly exhausted.

I have examined the "Searchlight" gas tanks and the "Avery" gas tanks, both for supplying acetylene gas for automobiles like the "Prest-O-Lite" tanks and the "Fireball" tanks, and am, therefore, able to state that the "Prest-O-Lite" tanks and the "Search-
201 light" tanks and the "Avery" tanks each and all provide an outlet for the gas located near the top of the tank. On the other hand, the "Fireball" tanks have their opening for the outlet of the gas in the center of the circumference of the end.

(Signed) AUGUST SEIM.

Sworn to and subscribed before me this 18th day of August, 1911. My term expires August 24, 1914.

[SEAL.] (Signed) MOSES HARTMANN,
Notary Public.

202 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Henry P. Deming, of lawful age, being duly sworn, on his oath states that he is manager of Hygeia Water & Soda Company, located at 1342 Chouteau Avenue, St. Louis, Missouri; that the business of said company is to manufacture and sell soda water, seltzer water, and similar carbonated beverages; and that he has been engaged in such business for more than thirty-two (32) years last past. Affiant further states that seltzer water is a beverage composed of water charged with highly compressel carbonic acid gas, said gas being absorbed by the water and forming therewith a supersaturated solution, the water absorbing the gas according to the well known physical law that water absorbs gases and that the proportion of gas thus ab-

sorbed increases in proportion to the increase of pressure under which the gas is forced thereinto. In accordance with this law carbonic acid gas is charged into water to form the seltzer water of commerce at a pressure of several atmospheres, and holds many times its own volume of carbonic acid gas. The supersaturated solution of water and carbonic acid gas is contained in glass bottles having metallic caps and stoppers for said bottles, said stoppers being adapted to control the outflow of the supersaturated solution of water and carbonic acid gas contained within the bottles. To show the construction of such cap and stopper for seltzer water bottles I produce and
203 file herewith a sample of same marked Defendant's Exhibit Sectioned Seltzer Bottle Valve, which exhibit shows the form in which the cap and stopper and valve for control of the outlet of gas and water from said seltzer water bottles have been made and used and sold during each and every year of the last thirty-two years, during all which time I have been familiar with said construction and have known of its being applied to and used on bottles of seltzer water in large numbers and during all of which time bottles of seltzer water having caps and valves like said exhibit Defendant's Exhibit Sectioned Seltzer Bottle Valve have been sold in immense numbers as ordinary articles of commerce. To show what has been sold in commerce as aforesaid in great quantities during every year of the last thirty-two years, during which period I have been engaged in said business, I produce, herewith, a bottle of seltzer water in the exact condition in which large numbers of same were sold and used prior to 1894 and during at least all of the last thirty-two years, same being marked Defendant's Exhibit Bottle of Seltzer Water, and, in order that it may be understood, give the following description of it: Said bottle of seltzer water marked Defendant's Exhibit Bottle of Seltzer Water embodies a closed vessel containing a supersaturated solution of a gas, namely, carbonic acid gas, produced by forcing carbonic acid gas into a solvent, namely, water, under pressure, said vessel having an outlet for the gas which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape therethrough, said means consisting of an ordinary valve, the whole constituting a prepared package consisting of a tight shell or vessel; a solvent of gas contained within said vessel; and carbonic acid gas dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a valve. I have known and used such prepared packages since 1876, same being then a well known article of commerce, and I have manufactured same and known their interior construction to be like that shown in Defendant's Exhibit Sectioned Seltzer Bottle Valve since 1879, during every year since which date I have manufactured and sold each and every year large numbers of such prepared packages as hereinbefore described consisting of a supersaturated solution of carbonic acid gas produced by forcing said gas into water under pressure, said water and said gas being contained within a closed vessel and said vessel having an outlet for the gas controlled by

a plain valve such as shown by Defendant's Exhibit Sectioned Seltzer Bottle Valve.

204 Affiant further states that during each and every year of the last forty (40) years an apparatus has been in use within the United States by manufacturers of carbonated waters consisting of a tank having an outlet for gas contained within said tank held in supersaturated solution in water within said tank, said gas outlet being controlled by an ordinary needle valve such as found in the "Prest-O-Lite" tanks, this apparatus consisting as a whole of a package comprising a supersaturated solution of carbonic acid gas in water under high pressure, a tank having an outlet, and a needle valve governing the emission of said supersaturated solution from said tank, the effect of opening said needle valve being to allow the water and gas in solution within the tank to escape and thereby causing the pressure of the gas remaining within the tank to decrease or to be reduced. This apparatus was used in large numbers as long ago as forty (40) years and continuously ever since for the purpose of holding the carbonic acid gas and water in solution and by reason of the pressure under which same was held to cause it, upon the opening of the needle valve, to escape into an adjoining cylinder or bottle, in order there to mix with a sweetening or flavoring material. This apparatus is known by the name of a horizontal apparatus for carbonating purposes. This apparatus has been on sale by Matthews Manufacturing Company, of New York City, New York, and also the Tufft Manufacturing Company, of Boston, Massachusetts, during all the period of forty (40) years aforesaid prior to this date. Defendant's Exhibit No. 38 is a sample of the needle valve used in the apparatus for containing said supersaturated solution of carbonic acid gas and water described in this paragraph, said needle valve hereinbefore referred to having always been during the past forty (40) years in the form of this exhibit.

(Signed) HENRY P. DEMING.

Sworn to and subscribed before me this 19th day of August, 1911.
My commission expires May 8, 1915.

(Signed) GLADYS WALTON,
Notary Public.

205 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Divison of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Clarence De Witt Lukens, of lawful age, duly sworn, deposes and says as follows:

I am a stockholder, director, and officer of Fireball Gas Tank & Illuminating Company, the corporation defendant herein. My office in that company is Vice President and, in connection with the business of that company, I perform such duties as are assigned to me by its Board of Directors.

I took two years' course in mechanical engineering in Lehigh University, located at Bethlehem, Pennsylvania, and I followed this with two years in practical mechanics in the locomotive shops of the Lehigh Valley Railway, at Easton, Pennsylvania, and after this I took a course in denistry and graduated therein at the University of Pennsylvania in 1892. I held the chair of Dental Anatomy in Marion Sims Dental College, located at St. Louis, Missouri, from 1897 to 1901, and I held the chair of Orthodontia in the St. Louis Dental College from 1901 to 1908. From 1908 and up to the present time I have been and am the dean of the faculty in the dental department of St. Louis University and lecturer therein on the subject of Orthodontia. I am, also, member of the St. Louis Academy of Science.

By reason of my aforesaid education and practical experience I am well acquainted with mechanical devices, including many
206 different kinds of valves and including reducing-valves and needle valves. I thoroughly understand the construction of both and the appropriate uses for each. I have invented numerous devices and have been granted United States letters-patent thereon.

I am the inventor of the valve shown and described in United States letters-patent No. 987,000, dated March 14, 1911, which patent is now owned by defendant Fireball Gas Tank & Illuminating Company by virtue of mesne assignments first from myself to David Leon Soloman of one-half interest and then from myself and said David Leon Soloman of all interest to said corporation, said corporation being a Missouri corporation.

Any and all gas tanks that have been manufactured either experimentally or otherwise by said Fireball Gas Tank & Illuminating Company have been manufactured by it in accordance with the

description and drawings of said patent No. 987,000, dated March 14, 1911, and I produce a certified copy of said patent, herewith, it being marked Defendant's Exhibit Defendant's Patent.

The drawing attached to the affidavit of Percy B. Hills filed in this cause and marked Defendant's Exhibit No. 2 is a correct drawing in every respect of defendant's tank and of its contents. I have read said affidavit of Percy B. Hills, including its statements relative to the construction, contents, mode of operation, and results of use, and its said statements are correct, and I furthermore concur in all the contents of said affidavit the same as if I herein repeated it verbatim.

The drawing attached to said affidavit of said Percy B. Hills marked Defendant's Exhibit No. 1 is a correct drawing of the "Prest-O-Lite" tank and contents, and correctly illustrates same. The statements contained in said affidavit of said Percy B. Hills regarding the construction, contents, mode of operation, and results of use of said "Prest-O-Lite" tank as illustrated by said Defendant's Exhibit No. 1 are in all respects correct, and I concur therein as if I herein repeated same verbatim.

The defendant, Fireball Gas Tank & Illuminating Company, has assigned to me the duty, as one of its officers and directors, of superintending that company's acetylene gas generating and compressing plant, and as such officer I have superintended the filling and refilling of "Fireball' gas tanks with acetylene gas. When said tanks have in the first instance been filled with "Terpeline," acetylene gas is introduced thereinto under pressure. The gas inlet is then closed.

When the valve at the end of the tank is opened and the
207 flame lit at the burners, the gas is gradually used until the supply of gas in the tank is consumed. The tank must then be recharged with acetylene gas. In all instances of recharging such tanks with acetylene gas that have yet occurred, I have found that the "Terpeline" in the tanks has not been at all depleted, but, on the contrary, have found as much "Terpeline" remaining in said tanks after the charge of acetylene gas has been burned out of same as when said tank was first filled with "Terpeline" and acetylene gas. This is not the case when acetone is used as the solvent. Defendants have never used acetone as a solvent, but have used exclusively "Terpeline" as their solvent for acetylene gas. It is well known, however, that when acetone is used as a solvent, as, for instance, in complainants' "Prest-O-Lite" tanks, it "blows" when the acetylene gas escapes, and the stock of solvent within the "Prest-O-Lite" tanks thus becomes depleted and must be renewed. This does not happen when "Terpeline" is used as solvent, because "Terpeline" is less volatile and more viscous than acetone, and, moreover, possesses a higher specific gravity . . . ious advantages result from using "Terpeline" instead of acetone. In the first place, it is an economy for the manufacturer not to be obliged to renew the solvent at each refilling of the tank with acetylene gas, but, in addition, advantages to users are thus obtained consisting in the absence of carbon deposit on the burners, which occurs when acetone is used as the solvent as in complainants' "Prest-O-Lite" tanks, and,

furthermore, in greater safety, due to the permanent presence of an adequate supply of solvent. To illustrate this, it may be mentioned that a given volume of acetone absorbs many times its own volume of acetylene gas. If, therefore, acetone is "blown" out of the tank with the escaping acetylene gas, the disproportion of acetylene gas to solvent within the tank increases at a high ratio, with the result that a large amount of acetylene gas within the tank will be freed from the safeguard of being held in solution in the liquid solvent. The use of "Terpeline" obviates the danger thus inherent in the use of acetone. Moreover, another important advantage to the public, that is to say, users of these gas tanks, arising from the use of "Terpeline" as the solvent, instead of acetone, resides in the fact that the permanent presence of a full amount of solvent in each tank results in each tank receiving and holding the full and proper charge of acetylene gas. If, for instance, a "Prest-O-Lite" tank is returned to one of the filling stations of The Prest-O-Lite Company, and in the hurry of business, or for any other reason, the supply of acetone is not filled up to the original standard, the tank
208 can not receive as large a charge of acetylene gas as it would if an adequate amount of solvent were within the tank. The result is that some purchaser later receives a "Prest-O-Lite" tank in which the supply of acetylene gas is deficient. This in part accounts for the numerous complaints that in the past have been made of the charge of acetylene gas in the "Prest-O-Lite" tanks being short. While nominally guaranteed to supply light for forty hours, the "Prest-O-Lite" tanks have been found often to be empty after burning for a much shorter period than that.

The drawings attached to the affidavit of Percy B. Hills marked, respectively, Defendant's Exhibits Nos. 1 and 2, depict, respectively, complainants' and defendant's tanks. Defendant's Exhibit No. 1 illustrates the "Prest-O-Lite" tank with its contents. The tank is a closed vessel. It is closed by a needle valve c^3. The reference numbers on this drawing are taken from the Claude & Hess patent No. 664,383, dated December 25, 1900. The reference numbers on Defendant's Exhibit No. 2 are taken from my patent No. 987,000 for an improvement in needle valves and means of attachment of same to a gas tank. Both complainants' and defendant's tanks—illustrated, respectively, in Defendant's Exhibits Nos. 1 and 2—are closed by needle valves; neither has a reducing-valve. The needle valve in the "Fireball" tank is designated by the reference number 8. The needle valve c^3 in Defendant's Exhibit No. 1 simply opens the passage c when turned in one direction and allows the gas to flow out of the tank, while it closes it when turned in the opposite direction. The operation of the needle valve 8 in Defendant's Exhibit No. 2 and the manner of connecting the hand-wheel 24 thereto is as described in my above-mentioned patent No. 987,000. The needle valve in the "Prest-O-Lite" tank does not control the gas outlet in such manner that the gas may escape therethrough at substantially uniform pressure, but controls it in such manner that the gas escapes therethrough at gradually decreasing pressure. This is true, also, of the "Fireball" tank. The meaning of claim 1 of the Claude &

Hess patent is to any one acquainted with the mechanical arts that some kind of an automatic device shall govern the gas outlet of the closed vessel mentioned in said claim 1 whereby the gas pressure will be so controlled that it will be substantially the same when the receptacle is fully charged as when it is nearly exhausted. The specification of the Claude Hess patent No. 664,383 clearly shows that this is the object that Claude & Hess were seeking to attain and means for which was included as one of the elements of
209 claim one of that patent, which means is more specifically referred to in all the other claims of that patent as a reducing-valve. Any such means is a reducing-valve. A needle valve is, however, never a reducing-valve any more than a needle valve is ever a flap valve. Just as a needle valve is never a flap valve so, also a needle valve is never a reducing-valve. Reducing-valves are a well known kind. They are sui generis. The gas is emitted from a full "Prest-O-Lite" tank or a full "Fireball" tank at tremendous pressure and with a loud noise. Both decrease as the supply of gas in said tanks becomes less. When nearly exhausted the outflow from both tanks is noiseless and its force weak. Neither defendant's nor complainants' tanks, therefore, are such receptacles, or when filled such packages, as defined by claims 1, 2, 5, or any of the claims of the Claude & Hess patent No. 664,383. In the drawing marked Defendant's Exhibit No. 1 the yellow part denotes the acetone which complainants use as a solvent for the acetylene gas. The specification of the Claude & Hess patent No. 664,383 states that it is an essential matter that the outlet for the gas shall be "so positioned as to be normally above the level of said solvent," and this is reiterated in all but one of the claims of said patent. If the specification of the Claude & Hess patent indicates any solvent as the one that the patentees preferred, that is alcohol, because the specification, which names only two solvents, mentions alcohol before it mentions acetone (line 77, page 1). The "Prest-O-Lite" tanks have, however, always contained acetone as the solvent; but whether alcohol or acetone be used as the solvent, each is a very highly volatile solvent and requires the positioning of the gas outlet in the manner described in the specification and referred to in all but one of the claims of the Claude & Hess patent No. 664,383. This location is, as the specification of said patent states, essential where a volatile solvent like either alcohol or acetone is used, because said solvent blows out of the tank with the gas when the gas escapes therethrough just as the water in a siphon of seltzer water blows out with the carbonic acid gas when the valve shown in Defendant's Exhibit Sectioned Seltzer Bottle Valve is opened. It is because the "Prest-O-Lite" tanks utilize such a volatile solvent as acetone and one having a specific gravity of only 0.790 in the form in which commercially procurable (the eleventh edition of the Encyclopedia Britannica gives the specific gravity of acetone as 0.819) that the "Prest-O-Lite" people find it necessary to locate the gas outlet in the upper part of their tanks and to mark their tanks "This side up," as shown in Defendant's Exhibit No. 1 and in Defendant's Exhibit
210 Sectioned "Prest-O-Lite" Tank. The drawing marked Defendant's Exhibit No. 2 shows plainly that it is not essential

to the "Fireball" tanks that the gas outlet be located above the level of the solvent, but, on the contrary, it is located at the point in the end of the tank where it will look the best, that is to say, in the center of the end of the tank. The red in said drawing shows the solvent used in the "Fireball" tanks as filling the whole tank. This it does because the asbestos with which "Fireball" tanks are filled is first soaked with "Terpeline." Because of the viscous and non-volatile character of "Terpeline" and the fact of its having a higher specific gravity (namely, 1.14) than acetone it abides in all parts of the asbestos, as shown in the drawing marked Defendant's Exhibit No. 2, and does not blow with the acetylene gas. It is strikingly obvious that the "Fireball" tanks do not bear the words "This side up", while the Prest-O-Lite tanks do bear that phrase. I have fully explained this matter above in this affidavit, but am now merely interpreting the showing of the drawings marked Defendant's Exhibits Nos. 1 and 2.

Defendant's Exhibit "Fireball" Tank filed herewith is an ordinary sample of the tanks of Fireball Gas Tank & Illuminating Company. The same is true of Defendant's Exhibit Sectioned "Fireball" Tank, but, of course, in this last-mentioned exhibit the asbestos has been omitted and, also, the yoke bearing the hand-wheel 24 and attached parts. Defendant's Exhibit Opened "Fireball" Tank shows the asbestos within the tank, one end of said tank having been removed and no valve attached at the other end. The "Prest-O-Lite" tank having an open end filed herewith and marked Defendant's Exhibit Opened "Prest-O-Lite" Tank shows the dependence of the "Prest-O-Lite" tanks for their commercial success upon the subject-matter described in Fouché patent No. 727,609, disclosing therein the blocks of asbestos for absorbing the acetone and immobilizing the acetylene gas.

I file herewith an exhibit marked Defendant's Exhibit Sectioned Avery Tank, which is a sample of the tank of defendant involved in the case at Milwaukee of Commercial Acetylene Co. v. Avery Portable Lighting Co., 166 Fed., 907.

I file herewith a tank marked Defendant's Exhibit Sectioned Searchlight Tank, which is a sample of the tank involved in the recent case at Chicago of Commercial Acetylene Co. and The Prest-O-Lite Co. v. Searchlight Gas Co., in which Judge Kohlsaat refused to grant a preliminary injunction.

I file herewith a bottle of commercial acetone, which bottle is marked Defendant's Exhibit Sample of Acetone.

211 I file herewith a bottle of "Terpeline," which is marked Defendant's Exhibit Sample of "Terpeline." This is a sample of the solvent that Fireball Gas Tank & Illuminating Company uses, and is the only solvent that it has ever used. It is not acetone; it contains no acetone. It is not alcohol; it contains no alcohol. It is unlike either alcohol or acetone in many respects. Alcohol and acetone are both highly inflammable, very volatile, and of low specific gravity. "Terpeline" possesses a higher specific gravity than either, it is noticeably less volatile, much more viscous than either, and is not inflammable. In fact, it is non-combustible.

I produce herewith a tank containing nitrous oxide gas under high pressure. This gas is the kind that is ordinarily used by dentists. I have known of such tanks being on sale commercially in large numbers and of their being extensively used for very many years, in fact continuously since prior to 1892, and I have myself continuously and in large numbers used them since prior to 1892. The sample tank produced herewith is marked Defendant's Exhibit Nitrous Oxide Tank. This tank is exactly like tanks which, as aforesaid, I have known and used since prior to 1892 and such as have been commonly known and used by all dentists since prior to 1892 and continuously up to the present time. This tank constitutes a closed vessel containing gas under high pressure, said vessel having an outlet for said gas, which gas escapes therefrom when the pressure is released, and means for controlling said outlet whereby the gas may escape therethrough at as substantially uniform pressure as that at which gas escapes from the "Prest-O-Lite" tanks, the whole composing a -pared package consisting of a tight shell or vessel, highly compressed gas contained within said vessel, and said package being provided with a needle-valve. Except for the improvement particularly claimed in my patent No. 987,000, the construction of which is embodied in the "Fireball" tanks, this construction is identical with that of said "Fireball" tanks, which resemble same very much more closely than they resemble the construction called for by the Claude & Hess patent No. 664,383. The construction of this nitrous oxide tank is that the tank has an opening in one end of it, said opening being plugged by an ordinary needle valve, said needle valve being provided with an angular end adapted to be operated with a wrench or key or the like. In order that the flow of gas through a tube or pipe may be suitably directed and, also, to provide convenient means for connection of said tube to the gas outlet plugged by said needle valve, a small pipe
212 mounted upon a yoke is provided, said yoke having a hand-screw that seats in a recess in a projection from said tank as means of attachment, said yoke having also a pinhole running therethrough connecting on the one side with said small pipe that connects with the tube, and on the other side with the gas outlet plugged by said needle valve, the function of said pinhole being greatly to reduce the flow of gas into the small pipe and tube as compared to the amount that the opening of the needle valve allows to flow out of the main tank. Some of complainants' affidavits speak of a needle valve as being a reducing-valve, because the opening of a needle valve allows some of the gas controlled thereby to escape, which, of course, results in the pressure in the remainder being lessened or decreased or reduced. To put such a statement into an affidavit can be only for the purpose of trying to mislead the court, as every one familiar with valves knows that a reducing-valve is a particular type of valve, just like a needle valve is a particular type of valve. In the sense in which complainants' said affidavits try to represent that a value that allows some of the gas under pressure to escape, thereby lessening both the quantity and pressure of the gas that is left in the tank, is a reducing-valve, it would be equally cor-

rect to call it a lessening valve or a decreasing valve, and in that same sense it will be observed that the pinhole of this nitrous oxide tank is much more a reducing-valve or decreasing valve than is the mere needle valve of the "Prest-O-Lite" or "Fireball" tanks, as it serves as an auxiliary to the needle valve of the nitrous oxide tank for the purpose of lessening or decreasing or reducing the flow of gas permitted by said needle valve. I attach to this affidavit a drawing of said nitrous oxide tank marked Defendant's Exhibit Nitrous Oxide Tank, said drawing being a correct drawing of said tank and said drawing being marked Defendant's Exhibit Drawing of Nitrous Oxide Gas Tank. This will assist in making plain my foregoing description, the pinhole in said yoke which serves for the lessening or decreasing or reducing purpose hereinbefore mentioned being marked with the reference number 1, said yoke being marked 2, the point of the needle valve, 3, the pipe for attachment to the tube gas conveyor 4, the handscrew 5, the recess in which said handscrew seats 6, and the chamber that communicates between the gas outlet 7 controlled by the needle valve 3 and the pinhole 1 being marked 8.

A reducing-valve is characterized by the essential constituent factor that it must operate automatically to equalize the pressure upon both sides thereof of some fluid such as a gas, the flow of which it controls. Any valve that does not operate automatically for
213 the purpose stated is not a reducing-valve and cannot be the mechanical equivalent therefor. The reason why it cannot be the mechanical equivalent therefor is because it will not do the same work. There are mechanical situations where it is more desirable than in others to regulate the escape of gas so as to deliver it at a uniform pressure at a certain point, as, for instance, at a plurality of burners, as in house-lighting, for which purpose the apparatus of the Claude & Hess patent No. 664,383, was manifestly intended. Said Claude & Hess patent does not contemplate automobile or vehicle lighting, but did contemplate house lighting by means of tanks of acetylene gas so controlled by automatic means such as a reducing-valve that the pressure of the gas at the burners would be substantially the same when the tank was nearly empty as when fully charged, this similarity of pressure at the burners whether the tank was full of gas or nearly empty being the "substantially uniform pressure" referred to in claim one of the Claude & Hess patent. While the expression in claim one of the Claude & Hess patent "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure" seems broader than the term "reducing-valve" in claim 2 of that patent, yet they can mean and refer to only the same thing. A needle valve cannot be the mechanical equivalent for either, because it is non-automatic and because it will not govern the flow of the gas in the manner required by the specification and claims of said Claude & Hess patent, so that (page 2, lines 17-20) the pressure will be "substantially the same when the receptacle is fully charged as when it is nearly exhausted," this being the effect intended to be produced by the element referred to in claim one of said Claude &

Hess patent in the following language: "means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure." This is the effect intended to be secured by the use of the "reducing-valve" mentioned in claims 2, 5, 3, 4, and 6 of the Claude & Hess patent. A needle valve does not perform this function nor anything resembling it, but allows the gas to escape from the tank with gradually decreasing pressure, to that when nearly empty the pressure will be extremely weak, while, on the other hand, when completely charged, the pressure will be very strong.

The affidavit of Percy B. Hills filed herewith explains that as a matter of patent law and practice claims 1 and 2 of the Claude & Hess patent No. 664,383 differ in the respect that claim 2 is properly drawn for a prepared package of a supersaturated solu-
214 tion of acetylene gas, while claim 1 is not limited to specific contents, although it contains certain words mentioning a supersaturated solution of acetylene gas, which contents is, however, not so mentioned in said claim as to be involved as part of the make-up of a package, but merely referred to as descriptive of one use to which the structure named in claim 1 may be applied, the structure designated by said claim being only "a closed vessel * * * having an outlet * * * and means for controlling said outlet" in an automatic manner. As hereinbefore pointed out, neither the "Prest-O-Lite" tanks nor the "Fireball" tanks respond to this claim, and, therefore, it naturally follows that they do not respond to claim 2 or any of the other claims of said Claude & Hess patent. If, however, a needle valve were improperly said to be the mechanical equivalent for a reducing-valve or for the automatic means mentioned in claim 1 of said Claude & Hess patent for controlling the flow of gas, then in Defendant's Exhibit Bottle of Seltzer Water we have complete anticipation of claims 1 and 2 of the Claude & Hess patent in suit, since siphons of seltzer water exactly such as shown in said exhibit have been extensively known and sold in large numbers throughout the United States since long prior to 1894 and continuously in every year since then, said siphons of seltzer water embodying in combination a closed vessel containing a supersaturated solution of gas produced by forcing same into a solvent under pressure, said vessel having an outlet for the gas when the pressure is released, and an ordinary valve which is not a reducing-valve for controlling said outlet whereby the gas may escape therethrough, same constituting a prepared package consisting of a tight shell or vessel; a solvent of gas contained within said vessel; and gas dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a plain cap valve. The only true difference between these ancient seltzer water siphons and claims 1 and 2 of the Claude & Hess patent in suit is that those claims are limited to the specific form of valve known as a reducing-valve, while the seltzer water bottle uses a cap valve. Claim 2 specifically names a reducing-valve, and is, therefore, limited thereto. Claim 1 by its language means a reducing-valve, and is, therefore, limited

thereto. So far as claim 1 is concerned, not being properly drawn for a prepared package, the difference in contents is immaterial, and claim 1 is only for the old structure shown, for instance,
215 in the Webb German patent, No. 58,927, the Gearing British patent No. 22,183 of 1894, and many others. The structure is shown by the seltzer water siphons (if a mere needle valve be erroneously called the mechanical equivalent for a reducing-valve) to have been used for the same purpose as that indirectly mentioned in claim 1 of the Claude & Hess patent, namely, that of holding a supersatuated solution of gas formed by forcing the gas into a solvent, the solvent in the seltzer water siphon being water and the gas carbonic acid gas; but, of course, novelty is not imparted to the structure of claim 1 by changing the contents of the tank from one supersaturated solution of gas to another, both said gases being for many years prior to 1894 well known to be soluble in water and both solvents "blowing" off with the gas when the opening of the valve permits their escape. Defendant's Exhibit Sectioned Seltzer Bottle Valve shows the internal construction of the cap and valve of the top of the exhibit marked Defendant's Exhibit Bottle of Seltzer Water, and I attach hereto a correct drawing of Defendant's Exhibit Sectioned Seltzer Water Bottle (said drawing being marked Defendant's Exhibit Sectional Drawing of Seltzer Bottle Valve), in order to afford convenient means of reference to its construction. In said drawing the cap valve 1 is lowered by the lever 2. When lowered off the valve-seat 3 the supersaturated solution of water and carbonic acid gas rushes out of the spout 4, such flow being checked by release of the hand pressure, the spring 5 thereupon automatically closing the valve 1 down upon the valve-seat 3.

The defendant Fireball Gas Tank & Illuminating Company was incorporated under the laws of the State of Missouri on October 21, 1910, and a pamphlet like that attached hereto and marked Defendant's Exhibit Fireball Pamphlet was handed to R. H. Combs in the early part of December, 1910, said R. H. Combs being then and now the St. Louis agent of The Prest-O-Lite Company, and at the time said pamphlet was handed to said R. H. Combs by the representatives of Fireball Gas Tank & Illuminating Company they informed said R. H. Combs that the "Fireball" tanks illustrated and referred to in said pamphlet would be put on the market soon.

Affiant further states that the circular attached hereto marked Defendant's Exhibit Prest-O-Lite Circular is a circular issued by one of the complainants, namely, The Prest-O-Lite Company, said circular being signed by James A. Allison, who is Secretary and Treasurer of said The Prest-O-Lite Company, the last paragraph of said circular reading as follows: "Our rights under these
216 patents are leased from the Commercial Acetylene Co., to whom we pay large royalties. We have now arranged to pay no more royalties until the validity of the patents is definitely decreed by the higher courts. We are therefore immediately giving the dealer the benefit of this saving in royalty, as you will note by the enclosed new list of prices."

Affiant further states that the business of defendant Fire-ball Gas

Tank & Illuminating Company was begun on March 3, 1911, and that it has been continued ever since, and by the investment and expenditure of much money and the work of those connected with it its said business has been extended and increased and has filled a public want and has given great satisfaction to the public, and that said public in the City of St. Louis is now to a large extent dependent upon the continuance of the business of said Fireball Gas Tank and Illuminating Company and that irreparable harm to defendants and to the public will be occasioned by the grant of an injunction pendente lite against the continuance of the business of said Fireball Gas Tank & Illuminating Company. Affiant further states that both David Leon Soloman and himself have given up profitable businesses in order to devote their entire time to the performance of their duties as officers, directors, and employees of Fireball Gas Tank & Illuminating Company, and that complainants have had ample opportunity earlier to apply for a preliminary injunction since the time in December, 1910, when the representatives of said Fireball Gas Tank & Illuminating Company handed the St. Louis agent, Mr. R. H. Combs, of The Prest-O-Lite Company, one of the books such as in evidence herein marked Defendant's Exhibit Fireball Pamphlet. Affiant furthermore states that if complainants were entitled at the time of the beginning of the business of Fireball Gas Tank & Illuminating Company on March 3, 1911, to a preliminary injunction, or at any time previously thereto and subsequent to the time in December, 1910, when complainants became aware of the intention of Fireball Gas Tank & Illuminating Company to enter into competition with complainants, or if complainants were entitled to such preliminary injunction for a reasonable number of days or other short period after March 3, 1911, yet that the inaction of complainants in filing suit and asking for such preliminary injunction has led defendants into investments and developments of said business of said Fireball Gas Tank & Illuminating Company that would not have occurred if complainants had moved with proper diligence for a preliminary injunction either before the actual beginning of the business of said
217 Fireball Gas Tank & Illuminating Company or immediately after March 3, 1911. In view of the fact that the German Claude & Hess patent for apparatus for storing and distributing acetylene gas, which mentions the reducing-valve in its claim just like the same device is mentioned in the claims of the patent suit, expired at the end of August 26, 1911, and the United States Claude & Hess patent in suit, therefore, expired on August 27, 1911, the inconvenience to defendants and, also, to the public of a temporary or provisional injunction will be very great and will largely overbalance any detriment that complainants may suffer because of refusing to enjoin the continuance of the business of Fireball Gas Tank & Illuminating Company, which has been growing and developing steadily through months of inactivity, neglect, and delay on the part of complainants. Affiant states that defendants are fully advised and believe that complainants will unquestionably fail at final hearing to maintain this suit against defendants because

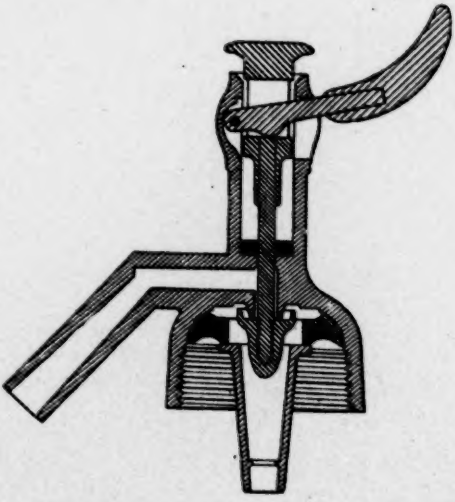
of the invalidity of the patent in suit as to claims 1, 2, 5, and 6 thereof and because of non-infringement of any claim of that patent by defendants, and, also, because of the expiration of said patent on June 30, 1910, by reason of the prior expiration of the corresponding British patent of Claude & Hess, No. 29,750 of 1896; and affiant points out that even if defendants have been misadvised in the respects just mentioned, nevertheless that complainants' claim against defendants can at most cover the period only from March 3, 1911, to and inclusive of August 26, 1911, because of the expiration of the corresponding German patent at midnight on August 26, 1911. Affiant states that automobile users in the City of St. Louis will be very greatly inconvenienced by any injunction against defendants that interferes with the continuance of the business of Fireball Gas Tank & Illuminating Company from now on for the limited period of time that on any calculation can be said to be likely to occur before final hearing of this cause.

The entire inside of the "Fireball" tanks is coated with a mixture of tin and lead making a sheath that completely separates the contents of the tank from the brass shell. If there were any danger from the contact of acetylene gas with brass, same would be obviated by this interior lining of the "Fireball" tanks. As a matter of fact, the highest authorities agree that there is no danger from contact of acetylene gas with brass or other alloys of copper or with copper. For instance, the eleventh edition of the Encyclopedia Britannica in its article entitled "Acetylene," Volume I, page 137, said article having been written by the Professor of Chemistry in the
218 Royal Naval College, Vivian Byam Lewes, F. I. C., F. C. S., who is, also, Chief Superintendent Gas Examiner to the Corporation of the City of London, contains the following: "When acetylene was first introduced on a commercial scale grave fears were entertained as to its safety, it being represented that it had the power of combining with certain metals, more especially copper and silver, to form acetylides of a highly explosive character, and that even with coal gas, which contains less than 1 %, such copper compounds had been known to be formed in cases where the gas-distributing mains were composed of copper, and that accidents had happened from this cause. It was therefore predicted that the introduction of acetylene on a large scale would be followed by numerous accidents unless copper and its alloys were rigidly excluded from contact with the gas. These fears have, however, fortunately proved to be unfounded, and ordinary gas fitting can be used with perfect safety with this gas."

"Fireball" tanks are much safer than "Prest-O-Lite" tanks for the reason, among others, that the solvent, "Terpeline," used in the "Fireball" tanks, is non-inflammable, while the solvent, acetone, used in the "Prest-O-Lite" tanks, is highly inflammable. Moreover, the tin and lead coating on the interior of the "Fireball" tanks covers every brass part thereof, while the brass valve ends and the like of the "Prest-O-Lite" tanks extend to the interior thereof and into direct contact with the acetylene gas without the safeguard of such tin and lead coating.

219

Defendant's Exhibit Drawing of Nitrous Oxide Gas Tank.



Defendant's Exhibit Sectional Drawing of Seltzer Bottle Valve.

The device filed herewith marked Defendants' Exhibit Sectioned "Fireball" Yoke is a regular "Fireball" yoke and valve such as is used on the "Fireball" gas tanks, the different parts of said device having been cut away, in order to show the exact mode of use and the passage for the flow of the gas and the internal construction.

CLARENCE DE WITT LUKENS.

Sworn to and subscribed before me this 26th day of September, 1911.

My term expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

(Here follow drawings marked pages 219 and 220.)

221 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

David Leon Soloman, of lawful age, being duly sworn, on his oath says that he is president of Fireball Gas Tank & Illuminating Company, the corporation defendant in the above-entitled cause, and that he is the David Leon Soloman who is co-defendant in said cause.

Affiant further states that he has never himself, *i. e.*, in his own proper person, that is to say, as an individual, manufactured or sold gas tanks of any kind and that such sales of "Fireball" tanks as have been made by him have been made by said Fireball Gas Tank & Illuminating Company and not by him personally, and that all his acts in connection with same have been as president and treasurer of said corporation defendant and not for or by himself personally or for his individual account, but only as an employee and officer of said corporation.

Affiant further states that said corporation was formed in October, 1910, and the charter thereof issued on October 21, 1910, and that the actual business operations of said corporation by way of sales did not begin until March 3, 1911, and that affiant has been investing time and money since March 3, 1911, in said corporation,

Affiant further states that in December, 1910, affiant handed to R. H. Combs, who is the St. Louis agent of The Prest-O-Lite Company, one of the complainants in this cause, a pamphlet
222 identical with the pamphlet filed herewith marked Defendants' Exhibit "Fireball" Pamphlet, and that then and on sundry other occasions before and after December, 1910, affiant gave notice to said R. H. Combs, agent at St. Louis for said The Prest-O-Lite Company, that Fireball Gas Tank & Illuminating Company would in the near future begin to sell gas tanks such as described in said pamphlet.

Affiant further states that immediately after circulars like the one in evidence in this cause marked Defendants' Exhibit "Prest-O-Lite" circular were distributed through the mails to dealers in automobile supplies, public garages, and the like, affiant was informed by a number of such dealers, managers of garages, and the like of the receipt by them of such circulars, and that in conversation with the abovementioned R. H. Combs, agent at St. Louis for said The Prest-O-Lite

Company, said R. H. Combs informed affiant that said The Prest-O-Lite Company had distributed through the mails thirteen thousand (13,000) circulars of the kind in evidence in this cause marked Defendants' Exhibit "Prest-O-Lite" circular.

DAVID LEON SOLOMAN.

Sworn to and subscribed before me this 31st day of August, 1911. My term expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

223 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri. City of St. Louis, ss:

Lee Meriwether, being duly sworn, on his oath states that he is a resident of the City of St. Louis, State of Missouri, and that his office is located in the Wainwright Building in said city; that by profession he is an attorney-at-law; that he has successively owned and driven several automobiles; that he drove one automobile on a trip of about five thousand miles through different countries in Europe, using thereon "Prest-O-Lite" tanks to furnish acetylene gas for his headlights, a narrative of his said trip being published in his book entitled "Seeing Europe by Automobile"; that prior to said trip he had used "Prest-O-Lite" tanks for his automobile headlights for a number of years; and that he is thoroughly familiar with said "Prest-O-Lite" tanks, their external construction, manner of attachment to automobiles, and quality of light.

Affiant further states that he has been using the "Fireball" tanks for a number of months and finds same much more satisfactory than the "Prest-O-Lite" tanks for several reasons, among which may be mentioned the fact that they throw a whiter light, having a better illuminating effect, and the further fact that it takes less time to attach them to automobiles, and, in addition, it is easier to turn on the gas or to turn it off, because no wrench or other tool is necessary for that purpose, but a slight turn of a hand-wheel suffices for that
224 purpose. For attachment to a machine no tool is necessary, because another hand-wheel makes the connection with the pipe lines and the holding clamps are tightened with small thumbnuts. On the other hand, many of the clamps for "Prest-O-Lite"

tanks are attached to machines by ordinary bolts and nuts, and, in every instance, it is necessary to use a monkey-wrench first to detach the empty "Prest-O-Lite" tank from the pipe line and later to attach the substituted full "Prest-O-Lite" tank to the pipe line. This takes more or less time (sometimes much time), and it is a considerable annoyance to automobile owners, but this annoyance is entirely obviated in the use of "Fireball" tanks. It is, also, much more convenient for an automobile owner to turn a hand-wheel to furnish gas to his headlights or to turn it off therefrom as is done in using "Fireball" tanks, than to get out a wrench to operate a "Prest-O-Lite" tank.

Affiant states that he has driven much on rural roads in Europe and America in the dark at night and, by his familiarity with the "Prest-O-Lite" light and the "Fireball" light, is able to state that the "Fireball" light is much superior for service on roads where the only light by which the driver can see his way is furnished by the headlights of the machine.

(Signed) LEE MERIWETHER.

Sworn to and subscribed before me this 22d day of August, 1911.
My term expires June 6th, 1914.

(Signed) ROBERT J. BRYAN,
Notary Public.

[SEAL.]

225 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

Harry S. Sanderson, being duly sworn, on his oath deposes and says as follows:

I am General Manager of West End Light & Power Company, and was from October, 1907, to January 1, 1910 (27 months) Supervisor of City Lighting of the City of St. Louis. Naturally, my duties as Lighting Supervisor, and also in my present position, have caused me to make a large number of comparisons of one light with another and of one lamp or light-giving means with another, and I have had many years of experience in so doing. I have, also, had much experience in using "Prest-O-Lite" acetylene gas tanks on my automobile, and have changed to using "Fireball" acetylene gas tanks, because the light afforded by the "Fireball"

tanks is whiter and, therefore, better than that derived from the "Prest-O-Lite" tanks. Acetylene gas, insofar as the kind of light it supplies is concerned, is the best illuminant, because of its light more nearly approaching sunlight, than any other artificial illuminating means, and, therefore, the whiter the acetylene light, the more desirable it is. That is why I prefer the whiter light given by the "Fireball" tanks to the light given by the "Prest-O-Light" tanks.

Moreover, the "Fireball" tanks are more convenient in two respects—first, in ease of attachment to the car, and, second, in turning on and off the light. The "Fireball" tanks are attached
226 to the gas pipes of cars by merely slipping a yoke carrying a needle valve over the valve body borne by the end of the tank and then fastening said yoke to said valve body by turning a hand-wheel, which operates a screw. In thus attaching "Fireball" tanks, the use of a monkey-wrench or other tool, such as is necessary in attaching a "Prest-O-Lite" tank, is obviated. The convenience in the use of the "Fireball" tank as compared to a "Prest-O-Lite" tank is that the gas can be turned on and off without the use of a wrench or a pair of pliers or other tool, the needle valve being operated by a mere hand-wheel.

I am familiar, from many years' study and experience with different kinds of mechanical appliances, including various kinds of valves. A reducing-valve is a distinct species of valve, and the term "reducing-valve" always means a valve of such a construction that it acts automatically to tend to equalize the pressure of the gas on both sides of the reducing-valve, its operation being as follows: When the amount of gas and, therefore, its pressure on the outlet side has become diminished by use, the reducing-valve automatically allows enough gas to flow through it from the supply side to restore the amount and pressure upon the outlet side. No such device nor anything in the slightest degree resembling it nor the mechanical equivalent for it is found in either the "Prest-O-Lite" tanks or the "Fireball" tanks. The valve in the "Prest-O-Lite" tank is the most ordinary and common kind of needle valve and serves the same function as the cork stopper in a bottle. The valve in the "Fireball" tanks is, likewise, a common, and ordinary needle valve, but somewhat improved, its chief merit being a change of construction to enable attachment by means of the yoke above mentioned.

(Signed) H. S. SANDERSON.

Sworn to and subscribed before me this 25th day of August, 1911.

My term expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

227 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Southern Division of the Western Judicial District of Missouri, State of Missouri, County of Greene, ss:

James H. Smith, being duly sworn, on his oath deposes and says as follows:

I reside in Springfield, Missouri. My occupation until recently was that of chief of detectives of the Metropolitan Police Force of the City of St. Louis. My duties in my official position as chief of detectives of this city made it necessary for me to drive my automobile a great deal after dark and at times and places when the highways are quite dark. I am now chief of the secret service department of St. Louis & San Francisco Railway Company. I have used on my automobile a very great many "Prest-O-Lite" tanks to furnish acetylene gas to the headlights of my machine, and, in a given length of time, have used as many "Prest-O-Lite" tanks as anyone else within the same period of time, if not more, due to the nocturnal nature of many of my trips. I have, also been using "Fireball" tanks almost since the first time when same were obtainable, and I have, naturally, made close observation by way of comparison of the light supplied by the "Fireball" gas tanks with the light of the "Prest-O-Lite" tanks with which I was and am familiar. The light of the "Fireball" tanks is much whiter and, therefore, more brilliant and better and more satisfactory than that of the "Prest-O-Lite" tanks. For lighting dark places, the whiter the light the better it is.

228 The "Fireball" gas tank is, in addition, much more convenient than the "Prest-O-Lite" tank, because the needle valve of the "Fireball" tank is operated by a mere hand-wheel, while the needle valve of the "Prest-O-Lite" tank requires the use of an implement of some kind, such as a key or wrench, to turn it.

JAMES H. SMITH.

Sworn to and subscribed before me this 9th day of September, 1911.

My term expires July 30, 1914.

[SEAL.]

J. L. HINE,
Notary Public.

229 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

O. C. Raines, being duly sworn, on his oath deposes and says as follows:

I reside in the City of St. Louis, State of Missouri. I am a physician, my office being in the Metropolitan Building. My professional duties necessitate my making many trips in my automobile at night, and I am, therefore, much interested in the character and quality of the road illumination furnished by the front lights of my automobile. I have for several years used the acetylene gas light furnished by the "Prest-O-Lite" tanks and am very familiar with the "Prest-O-Lite" tanks and the kind of light furnished by them. I have recently changed from the use of "Prest-O-Lite" tanks to the use of "Fireball" tanks and have found the light furnished by the "Fireball" gas tanks uniformly whiter and, therefore, brighter and a better illuminant of dark roadways than the light furnished by the "Prest-O-Lite" tanks. This better light enables me to see objects lying in the road and rough places sooner and thereby to avoid tire punctures and wear. I may add that the "Fireball" tanks are much more convenient to use than the "Prest-O-Lite" tanks be-
230 cause the "Prest-O-Lite" tanks can be operated only by a wrench-like key or similar tool, while the "Fireball" tanks are more easily operated by their hand-wheel, which does away with the necessity of using any tool.

(Signed) O. C. RAINES, M. D.

Sworn to and subscribed before me this 7th day of September, 1911.

My term expires June 24, 1912.

[SEAL.] (Signed) JULIA E. FARRELL,
Notary Public.

231 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,

v.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

KINGDOM OF GREAT BRITAIN,
County of Lancaster, City of Liverpool, ss:

William Phillips Thompson, being duly affirmed, deposes and says that he is of lawful age and a resident of the City of Liverpool, County of Lancaster, England, and that for thirty-eight (38) years last past he has been engaged in the occupation of British solicitor of patents and adviser concerning British patents and that he is thoroughly familiar with the laws of Great Britain regarding letters-patent for inventions, and that he is a member of the Chartered Institute of Patent Agents of London, England. Affiant further states that he is thoroughly conversant with all the provisions of the laws of Great Britain regarding the term, expiration, and patented period of British letters-patent for inventions. Affiant further states that he has examined into the British patent known as No. 29,750 of 1896, in the name of Georges Claude and Albert Hess, entitled for "An improved method of storing acetylene for lighting and other purposes," and that the records of the British Patent Office show the following data concerning said patent, which was applied for under the International Convention:

"Date claimed for Patent under Sect. 103 of the Act, being date of first Foreign Application (in France), 30th June, 1896.

Date of application (in the United Kingdom) 24th December, 1896.

Complete Specification left 8th September, 1897.

232 Accepted 24th December, 1897, the patent being granted on the 15th March, 1898, and sealed as of the 30th June, 1896."

Affiant further states that the effective date of patenting of the subject-matter of said British patent, and the date from which it began to run, was June 30th, 1896; that the usual term for which all British letters-patent for inventions are granted is fourteen (14) years from the date of the patent, and that only in certain exceptional cases arising under unusual circumstances is the term for which a British patent is granted other than fourteen (14) years, and in all such cases is for less than fourteen (14) years; that the date of the patent of Georges Claude and Albert Hess, No. 29,750, of 1896, is June 30th, 1896; and that this patent was granted for fourteen years from that date; and that the term of grant of this patent expired June 30th, 1910.

Affiant further states that said Claude & Hess British patent No. 29,750, of 1896, was granted subject to the fulfillment of certain conditions required by the patent law of Great Britain, viz., the payment of taxes thereon at the end of the fourth year and subsequent years; that the said taxes due June 30, 1900, were not paid at any time by the patentees or by any one else, and that in consequence of such failure to pay said taxes the said British patent No. 29,750, of June 30, 1896, expired and lapsed on June 30, 1900, and the subject-matter thereof became public property on that date.

In other words, all the rights, privileges, and benefits granted by said Claude & Hess British patent, No. 29,750, dated June 30, 1896, would have by the terms of the original grant have in any event expired on June 30, 1910, but, by reason of the non-payment of the taxes due June 30, 1900, all said rights, privileges, and benefits ceased to exist as and from June 30, 1900.

(Signed) WILLIAM PHILLIPS THOMPSON.

Affirmed and subscribed before me this 23d day of August, 1911.

(Signed) GEORGE B. STEPHENSON,
Vice and Deputy Consul of the United States of America at Liverpool.

[CONSULAR SEAL.]

233 In the United States Circuit Court in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

Answer.

The Separate Answer of Fireball Gas Tank & Illuminating Company, Defendant, to the Bill of Complaint of Commerical Acetylene Company and The Prest-O-Lite Company, Complainants.

This defendant now, and at all times, saving and reserving unto itself all and all manner of benefit and advantage of exception which can or may be had or taken to the errors, uncertainties, and other imperfections contained in the bill of complaint herein, for answer thereunto or unto so much or such parts thereof as it is advised it is material to make answer unto, says as follows:

1. This defendant, Fireball Gas Tank & Illuminating Company, expressly and explicitly denies having done or committed any act or series of acts, either alone or jointly with any one else, in infringement of letters-patent No. 664,383, issued December 25, 1900, to Georges Marie Auguste Claude and Georges Albert Hess, or in viola-

tion of any rights of complainants or any one else under and in connection with said patent.

2. Defendant avers that, while the application for said letters-patent No. 664,383 was pending in the Patent Office, the claims made and proposed by the applicants were rejected by the Patent Office and that same were subsequently modified and limited by the applicants to avoid the anticipating effect of the disclosure of the prior art cited by the Patent Office against said application and that by reason of the expressed limitations in the claims of said patent No. 664,383, and, also, by reason of the limiting effect, due to the disclosure of
234 the relevant art antedating by more than two years the filing of the application for said letters-patent, they are restricted in their scope to the subject-matter precisely claimed and defined by the claims of said letters-patent.

3. This defendant, Fireball Gas Tank & Illuminating Company, avers that the state of the art antedating by more than two years the filing of the application for said letters-patent No. 664,383 was such as to make the subject-matter of said letters-patent and of the claims thereof devoid of novelty and patentable invention.

4. This defendant, Fireball Gas Tank & Illuminating Company, furthermore avers that the subject-matter of said letters-patent No. 664,383 is destitute of utility.

5. This defendant further states and avers that the specification of the patent sued on does not sufficiently describe the state of the art to which complainants' alleged invention belongs, so as to show its real place in the art, nor does it disclose the precise points in which it differs from all inventions previously known, thus distinguishing the new matter claimed to be covered by said letters-patent from that already in possession of the public or other inventors and patentees, and that it does not correctly and sufficiently describe the method of operating said alleged invention, and the process of making, constructing, and using it, as required by the statutes made and provided.

6. This defendant says that complainants have full, adequate, and complete relief at law, and that this court, as a court of equity, has no jurisdiction.

7. This defendant, Fireball Gas Tank & Illuminating Company, furthermore avers that said Georges Marie Auguste Claude and Georges Albert Hess were not the original, first, and true inventors of the alleged invention purporting to be the subject-matter of said patent No. 664,383, or of any material or substantial part thereof, but, on the contrary, that the same and all material and substantial parts thereof had before their alleged invention and more than two years prior to the date of filing the application in the United States Patent Office for said letters-patent been fully and clearly described in the following letters-patent and printed publications:

United States Patents.

No. 130,924, granted to Isaac Linsley, August 27, 1872;
No. 190,037, granted to Charles T. Holloway and William H. H. Stineman, April 24, 1877;

235 No. 224,240, granted to Albert Stearns, February 3, 1880;
No. 240,423, granted to Alexander James, April 19, 1881;
No. 261,607, granted to Ebenezer Hill, July 25, 1882;
No. 394,018, granted to Thomas Saunders and William Henry Patton, December 4, 1888;
No. 567,764, granted to Robert Munn Dixon, September 15, 1896;
No. 577,989, granted to August Heinrich Schülke, March 2, 1897;
No. 582,274, granted to Edward N. Dickerson and Julius J. Suckert, May 11, 1897;
No. 662,258, granted to Edward N. Dickerson, November 20, 1900.

British Patents.

No. 9,901, granted to Charles Denton Abel, July 14, 1887;
No. 22,183, granted to Ernest George Gearing, November 16, 1894.

German Patents.

No. 58,927, granted to George Webb, dated December 5, 1890;
No. 82,437, granted to H. Loesner, dated December 13, 1894.

Printed Publications.

"Annales de Chimie et de Physique", published in Paris, France, in 1866, Volume IX, and particularly page 425 thereof.

"The Carbides and Acetylene Commercially Considered", by T. L. Willson and J. J. Suckert, Ph. D., published in the Journal of the Franklin Institute of May, 1895, Volume 139, and particularly page 324 thereof.

"Watts's Dictionary of Chemistry", published in 1875, Volume 2, and particularly page 791 thereof.

"Wurtz's Dictionary of Chemistry", published in 1875, Volume 1, Part 1, and particuarly page 43 thereof.

"Treatise on Beverages", by Sulz, published in 1888, in New York, and particularly pages 119 and 123 thereof.

"Treatise on Chemistry", by Roscoe & Schorlemmer, published in New York in 1891, and particularly pages 135 and 441 thereof.

236 "Davy's Guide to Chemists", published in London in 1836, and particularly page 23 thereof.

"Storer's First Outlines of a Dictionary of Solubility", published in 1864, and particularly page 16 thereof.

"Gmelin's Handbook of Chemistry", published in London in 1853, Volume 8, and particularly page 257 thereof.

"Das Gas von Pfeiffer", published in Germany in December, 1895, and particularly page 20 thereof.

"Commercial Organic Analysis", by Alfred H. Allen, published in Philadelphia in 1900, 3d edition, Volume II, part II, and particularly page 29 thereof.

8. This defendant avers that the said alleged invention purporting to be embraced in said letters-patent No. 664,383, and all material

and substantial parts thereof, had before the alleged invention thereof by said Georges Marie Auguste Claude and Georges Albert Hess, been fully and clearly described in many other United States and foreign patents and printed publications, the names, numbers, and dates of which defendant is not now able to specify, but prays to be allowed hereafter to add by amendment to this answer or otherwise if it shall become necessary.

9. On information and belief this defendant avers that said alleged invention had been known and in public use and on sale in this country for more than two years prior to the filing of the application for letters-patent herein sued upon, to-wit:

Known to and publicly used by Isaac Linsley at Pawtucket, Rhode Island, and elsewhere, which use is known to said Isaac Linsley and others of said Pawtucket.

Known to and publicly used by Charles T. Holloway and William H. H. Stineman at Baltimore, Maryland, and elsewhere, which use is known to said Charles T. Holloway and William H. H. Stineman and others of said Baltimore.

Known to and publicly used by Albert Stearns at Brooklyn, New York, and elsewhere, which use is known to said Albert Stearns and others of said Brooklyn.

Known to and publicly used by Ebenezer Hill at South *Norfolk*, Connecticut, and elsewhere, which use is known to said Ebenezer Hill and others of said South *Norfolk*.

Known to and publicly used by Thomas Saunders and William Henry Patton at Pueblo, Colorado, and elsewhere, which use is known to said Thomas Saunders and William Henry Patton and others of said Pueblo.

Known to and publicly used by Robert Munn Dixon at East Orange, New Jersey, and elsewhere, which use is known to said Robert Munn Dixon and others of said East Orange.

237 Known to and publicly used by Edward N. Dickerson and Julius J. Suckert at New York, New York, and elsewhere, which use is known to said Edward N. Dickerson and Julius J. Suckert and others of said New York.

Known to and publicly used by Angelo Rosso of 516 Elm Street, at St. Louis, Missouri, and elsewhere, which use is known to said Angelo Rosso and others of said St. Louis.

Known to and publicly used by dentists generally throughout the United States for more than two years prior to the filing of the application for the patent in suit, which use is known to Dr. Clarence De Witt Lukens, of St. Louis, Missouri, and by dentists generally.

Known to and publicly used and sold by Henry P. Deming at St. Louis, Missouri, and numerous other persons, at St. Louis, Missouri, and elsewhere, which use is known to said Henry P. Deming and others of said St. Louis.

10. This defendant, Fireball Gas Tank & Illuminating Company, denies that it has made and received large or any profits and advantages from infringement of said letters-patent and denies that complainants have suffered and sustained great or any loss and

damage by reason of any acts of this defendant in violation of any alleged rights of complainants in connection with said letters-patent.

11. This defendant further states that the alleged invention of the Claude & Hess United States patent, No. 664,383, was patented to Georges Claude and Albert Hess by British patent No. 29,750 as of June 30, 1896, and as of a term beginning June 30, 1896, and expiring June 30, 1910, provided that all taxes thereon were regularly paid, as required by the laws of Great Britain; that, as granted, said British letters-patent would, in any event, have expired on June 30, 1910, but that for failure to pay the fifth year's tax said British letters-patent lapsed on June 30, 1900, and thereupon terminated, and the subject-matter thereof became at once open to the public for its use; that said lapse of said British patent having occurred prior to the issuance of the United States patent No. 664,383, said United States patent was invalid and void from the beginning; and that even if said United States patent No. 664,383, had not been invalid and void from the date of its issuance, by reason of its having issued subsequent to the lapse of said British patent, its term expired not later than June 30, 1910, by reason of the cessation on that date of the term for which said British patent No. 29,750 of June 30, 1896, was originally granted, subject to the payment of taxes as aforesaid.

238 12. Defendant furthermore states that the same alleged invention as that of United States patent No. 664,383 was patented by the same patentees by letters-patent of the Republic of France, No. 257,679, dated June 30, 1896, for a term of fifteen years from June 30, 1896, providing that taxes thereon were regularly paid, as required by the French law, and provided further that other provisions of the French law were observed, and that the term of said French letters-patent expired June 30, 1911, and that, therefore, said United States patent No. 664,383 expired not later than June 30, 1911.

13. This defendant furthermore states that the same alleged invention as that of said United States Claude & Hess patent No. 664,383 was patented to the same patentees by letters-patent of the Empire of Germany No. 97,953, dated August 27, 1896, for a term of fifteen years from and after August 27, 1896, and that the term of said German patent No. 97,953 will expire by limitation and be at an absolute end on August 26, 1911, and that the claim of said German letters-patent No. 97,953, is the same as claims one, two, and five of the Claude & Hess United States patent No. 664,383, in addition to the invention described in the specification of both patents being the same.

14. This defendant furthermore states that the acts by defendants, or either of the defendants, in this cause complained of by the bill of complaint herein, which acts have been solely of the corporation defendant herein and not of the individual defendant and which acts do not infringe any rights of complainants under the Claude & Hess patent No. 664,383 or otherwise, have taken place subsequent to the expiration of the Claude & Hess United States patent No.

664,383 by limitation of law to correspond to the term of said British patent No. 29,750 of June 30, 1896.

15. This defendant furthermore states that by reason of the expiration of the Claude & Hess United States patent No. 664,383 as aforesaid, the bill of complaint herein does not state a cause of action cognizable by a court of equity.

16. This defendant states that complainants are not entitled to remedy against this defendant, or against its co-defendant, by way of injunction.

17. This defendant further states that the Claude & Hess United States patent No. 664,383 is, and always has been, invalid and void and of no effect in law because of anticipation thereof by prior patents and publications published more than two years prior to the filing in the United States Patent Office of the application therefor and more than two years prior to the alleged making of
239 said invention by said Claude & Hess.

18. This defendant denies that on or before March 1, 1897, Georges Marie Auguste Claude and Georges Albert Hess were the true, joint, original, and first inventors and discoverers of an improved apparatus for storing and distributing acetylene gas, such as described in United States patent No. 664,383 and furthermore denies that same was not known and used by others in this country before their alleged invention or discovery thereof and not patented or described in any printed publication in this and foreign countries before their alleged invention or discovery thereof and not more than two years prior to their application for letters-patent therefor in this country and that the same had not been in public use and on sale in this country for more than two years prior to their said application and that the same had not been abandoned and that the same had not been first patented or caused to be patented by the said alleged inventors and their legal representatives and assigns in a country foreign to the United States upon an application filed more than seven months prior to the filing of said application in this country and furthermore denies that said Claude & Hess made application for letters-patent of the United States on March 1, 1897, or at any time in accordance with the then existing laws of this country; and this defendant avers that on June 30, 1896, which is more than seven months prior to the filing by said Claude & Hess of application for the United States patent in suit, said Claude & Hess filed application for letters-patent of the Republic of France, which issued thereon as No. 257,679, dated June 30, 1896, the term of which began to run on said June 30, 1896, the alleged invention of said French patent and of said patent in suit being the same; and this defendant furthermore avers that thereafter said Claude & Hess filed an application for a British patent for the same invention and claimed, under the British law, as the effective date of such application and the date from which, the term of said British patent began to run, June 30, 1896, thereby making their application for said British patent the same as if filed on June 30, 1896, simultaneously with their application for said French patent, said British application eventuating in British patent No. 29,750 of June 30, 1896. This defendant furthermore avers that

said Claude & Hess did abandon the subject-matter of the patent in suit and that the same was in public use and on sale in this country for more than two years prior to their application for the patent in suit and that the same was described in printed publications published before their alleged invention and discovery thereof and
240 more than two years prior to their application for the patent in suit and that the same was known and that the same was used by others in this country before their alleged invention or discovery thereof.

19. This defendant states that it has no knowledge or information on which it can base a belief as to whether or not said Claude & Hess complied in all respects with the conditions and requirements of the laws of the United States and regulations of the Patent Office of the United States, as alleged in the second paragraph of the bill of complaint herein, and as to whether or not United States patent No. 664,383 was signed, sealed, and executed in due form of law, and leaves complainants to make such proof thereof as complainants may deem proper.

20. This defendant says that it has no knowledge or information upon which it can base a belief regarding the allegations in the second and third paragraphs of the bill of complaint as to assignments affecting the title of said United States patent No. 664,383 or as to the effect of said alleged assignments, and, therefore, leaves complainants to make such proof thereof as they may deem proper.

21. This defendant states that it has no knowledge or information on which it can form a belief as to the allegations of the fourth paragraph of the bill of complaint herein regarding the alleged license by Commercial Acetylene Company of The Prest-O-Lite Company or as to the nature of said alleged license, and, therefore, leaves complainants to make such proof thereof as complainants may deem proper.

22. This defendant denies that The Prest-O-Lite Company has, at any time, been engaged in manufacturing devices and structures, such as described and claimed in the patent in suit No. 664,383, and furthermore denies that said The Prest-O-Lite Company has since October, 1904, or at any time manufactured and sold great numbers of said devices or any at all of said devices, but this defendant avers that the 500,000 tanks that the fifth paragraph of complainants' bill of complaint herein alleges that said The Prest-O-Lite Company has manufactured and sold have all been of a type and character different from the subject-matter of the patent in suit and not made in accordance therewith, and if marked by complainants or either of them with the word "Patented" and the date of the patent in suit, so marked improperly, because made not in accordance with the patent in suit, but in a form of construction unprotected by the patent in suit. This defendant furthermore avers that the subject-matter of the patent in suit has not been at all commercially sold or used and has not gone into extensive use and sale for any
241 purpose. This defendant furthermore denies that complainants are able to meet the demand for apparatuses containing and embodying the alleged invention of the patent in suit and further-

more denies that complainants are able to meet the demand for the unpatented apparatus called "Prest-O-Lite" tanks that said complainant, The Prest-O-Lite Company, has been making and selling under the pretense that same are protected by the patent in suit.

23. This defendant denies that the alleged invention of the patent in suit has been of great or any benefit and advantage to the public and that the public has generally or at all acquiesced in the rights that complainants assert under the patent in suit, and defendant avers that the claims of complainants under the patent in suit have been successfully resisted in litigation and that at least one court has held that said patent has expired. This defendant denies that defendants have in any manner interfered with the enjoyment by complainants of any rights belonging to them.

24. This defendant denies that complainants have notified this defendant of its aforesaid letters-patent and furthermore denies that said notice has been in conformity with the requirements of the statutes in such cases made and provided and furthermore denies that complainants have warned or requested this defendant to desist from manufacture, use, and sale of articles containing the alleged invention of the patent in suit.

25. This defendant avers that the gas tanks of Fireball Gas Tank & Illuminating Company are manufactured in accordance with United States patent No. 987,000, dated March 14, 1911.

26. This defendant denies that either this defendant or its co-defendant has made or used or sold any tanks which embody the subject-matter of the patent in suit. This defendant furthermore denies that complainants will sustain great or irreparable loss and injury, by reason of anything that has been done or will be done by this defendant or its co-defendant, and furthermore denies that any of its acts will have the effect to encourage and induce others to infringe the patent in suit.

27. This defendant, having fully answered to said bill of complaint, in so far as it is advised that the same is material and proper to be answered unto, denies each and every allegation thereof not expressly admitted herein, and denies that said complainants are entitled to the relief, or any part thereof, in said bill of complaint demanded or to any relief whatsoever, and prays the same
242 advantage of its aforesaid answer as if it had pleaded or demurred to the said bill of complaint, and prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

FIREBALL GAS TANK & ILLUMINATING COMPANY,

(Signed) By DAVID LEON SOLOMAN, *President.*

(Signed) HUGH K. WAGNER,
Solicitor and Counsel for Defendant.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

David Leon Soloman, being duly sworn, on his oath states that he is President of Fireball Gas Tank & Illuminating Company, one of the defendants named in the bill of complaint in the above-entitled cause; that he has read the foregoing answer and knows the contents thereof; that the facts therein stated are true of his own knowledge, except those therein stated on information and belief, and, as to those, he believes same to be true.

(Signed) DAVID LEON SOLOMAN.

Sworn to and subscribed before me this 21st day of August, 1911. My term expires May 8, 1915.

(Signed) GLADYS WALTON,
[SEAL.] *Notary Public.*

243 In the United States Circuit Court in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Defendants.

Answer.

The Separate Answer of David Leon Soloman, Defendant, to the Bill of Complaint of Commercial Acetylene Company and The Prest-O-Lite Company, Complainants.

This defendant now, and at all times, saving and reserving unto himself all and all manner of benefit and advantage of exception which can or may be had or taken to the errors, uncertainties, and other imperfections contained in the bill of complaint herein, for answer thereunto or unto so much or such parts thereof as he is advised it is material to make answer unto, says as follows:

1. This defendant, David Leon Soloman, states that he is president of the co-defendant, Fireball Gas Tank & Illuminating Company, and that the acts that the bill of complaint in this cause alleges have been committed by this defendant, David Leon Soloman, and which acts said bill of complaint claims constitute infringement of said Claude & Hess patent, No. 664,383, have been performed by this defendant, David Leon Soloman, solely in his official capacity as an officer and employee of said co-defendant, Fireball Gas Tank & Illuminating Company, and not otherwise, and have been in pursuance of the duties of this defendant, David Leon Soloman, as an officer and employee of said co-defendant, Fireball

Gas Tank & Illuminating Company, and not as the individual acts of this defendant, David Leon Soloman; and this defendant denies that said acts in themselves constitute infringement of said Claude & Hess patent, No. 664,383, either by this defendant or his co-defendant, Fireball Gas Tank & Illuminating Company.

244 2. This defendant, David Leon Soloman, expressly and explicitly denies having done or committed any act or series of acts, either alone or jointly with any one else, in infringement of letters-patent No. 664,383, issued December 25, 1900, to Georges Marie Auguste Claude and Georges Albert Hess, or in violation of any rights of complainants or any one else under and in connection with said patent.

3. Defendant avers that, while the application for said letters-patent No. 664,383 was pending in the Patent Office, the claims made and proposed by the applicants were rejected by the Patent Office and that same were subsequently modified and limited by the applicants to avoid the anticipating effect of the disclosure of the prior art cited by the Patent Office against said application and that by reason of the expressed limitations in the claims of said patent No. 664,383 and, also, by reason of the limiting effect, due to the disclosure of the relevant art antedating by more than two years the filing of the application for said letters-patent, they are restricted in their scope to the subject-matter precisely claimed and defined by the claims of said letters-patent.

4. This defendant, David Leon Soloman, avers that the state of the art antedating by more than two years the filing of the application for said letters-patent No. 664,383 was such as to make the subject-matter of said letters-patent and of the claims thereof devoid of novelty and patentable invention.

5. This defendant, David Leon Soloman, furthermore avers that the subject-matter of said letters-patent No. 664,383 is destitute of utility.

6. This defendant further states and avers that the specification of the patent sued on does not sufficiently describe the state of the art to which complainants' alleged invention belongs, so as to show its real place in the art, nor does it disclose the precise points in which it differs from all inventions previously known, thus distinguishing the new matter claimed to be covered by said letters-patent from that already in possession of the public or other inventors and patentees, and that it does not correctly and sufficiently describe the method of operating said alleged invention, and the process of making, constructing, and using it, as required by the statutes made and provided.

7. This defendant says that complainants have full, adequate, and complete relief at law, and that this court, as a court of equity, has no jurisdiction.

8. This defendant, David Leon Soloman, furthermore avers that said Georges Marie Auguste Claude and George Albert Hess

245 were not the original, first, and true inventors of the alleged invention purporting to be the subject-matter of the said patent No. 664,383 or of any material or substantial part thereof,

but, on the contrary, that the same and all material and substantial parts thereof had before their alleged invention and more than two years prior to the date of filing the application in the United States Patent Office for said letters-patent been fully and clearly described in the following letters-patent and printed publications:

United States Patents.

No. 130,924, granted to Isaac Linsley, August 27, 1872;
" 190,037, " " Charles T. Holloway and William H. H. Stineman, April 24, 1877;
" 224,240, " " Albert Stearns, February 3, 1880;
" 240,423, " " Alexander James, April 19, 1881;
" 261,607, " " Ebenezer Hill, July 25, 1882;
" 394,018, " " Thomas Saunders and William Henry Patton, December 4, 1888;
" 567,764, " " Robert Munn Dixon, September 15, 1896;
" 577,989, " " August Heinrich Schulke, March 2, 1897;
" 582,274, " " Edward N. Dickerson and Julius J. Suckert, May 11, 1897;
" 662,258, " " Edward N. Dickerson, November 20, 1900.

British Patents.

No. 9,901, granted to Charles Denton Abel, July 14, 1887;
" 22,183, " " Ernest George Gearing, November 16, 1894.

German Patents.

No. 58,927, granted to George Webb, dated December 5, 1890;
" 82,437, " " H. Loesner, dated December 13, 1894.

Printed Publications.

"Annales de Chimie et de Physique", published in Paris, France, in 1866, Volume IX, and particularly page 425 thereof.

246 "The Carbides and Acetylene Commercially Considered", by T. L. Willson and J. J. Suckert, Ph. D., published in the Journal of the Franklin Institute of May, 1895, Volume 139, and particularly page 324 thereof.

"Watts's Dictionary of Chemistry", published in 1875, Volume 2, and particularly page 791 thereof.

"Wurtz's Dictionary of Chemistry", published in 1875, Volume 1, Part 1, and particularly page 43 thereof.

"Treatise on Beverages", by Sulz, published in 1888, in New York, and particularly pages 119 and 123 thereof.

"Treatise on Chemistry", by Roscoe & Schorlemmer, published in New York in 1891, and particularly pages 135 and 441 thereof.

"Davy's Guide to Chemists", published in London in 1836, and particularly page 23 thereof.

"Storer's First Outlines of a Dictionary of Solubility", published in 1864, and particularly page 16 thereof.

"Gmelin's Handbook of Chemistry", published in London in 1853, Volume 8, and particularly page 257 thereof.

"Das Gas von Pfeiffer", published in Germany in December, 1895, and particularly page 20 thereof.

"Commercial Organic Analysis", by Alfred H. Allen, published in Philadelphia in 1900, 3d edition, Volume II, Part II, and particularly page 29 thereof.

9. This defendant avers that the said alleged invention purporting to be embraced in said letters-patent No. 664,383, and all material and substantial parts thereof, had before the alleged invention thereof by said Georges Marie Auguste Claude and George Albert Hess, been fully and clearly described in many other United States and foreign patents and printed publications, the names, numbers, and dates of which defendant is not now able to specify, but prays to be allowed hereafter to add by amendment to this answer or otherwise if it shall become necessary.

10. On information and belief this defendant avers that said alleged invention had been known and in public use and on sale in this country for more than two years prior to the filing of the application for letters-patent herein sued upon to wit:

Known to and publicly used by Isaac Lindsley at Pawtucket, Rhode Island, and elsewhere, which use is known to said Isaac Linsley and others of said Pawtucket.

Known to and publicly used by Charles T. Holloway and William H. H. Stineman at Baltimore, Maryland, and elsewhere, which use is known to said Charles T. Holloway and William H. H. Stineman and others of said Baltimore.

247 Known to and publicly used by Albert Stearns at Brooklyn, New York, and elsewhere, which use is known to said Albert Stearns and others of said Brooklyn.

Known to and publicly used by Ebenezer Hill at South Norfolk, Connecticut, and elsewhere, which use is known to said Ebenezer Hill and others of said South Norfolk.

Known to and publicly used by Thomas Saunders and William Henry Patton at Pueblo, Colorado, and elsewhere, which use is known to said Thomas Saunders and William Henry Patton and others of said Pueblo.

Known to and publicly used by Robert Munn Dixon at East Orange, New Jersey, and elsewhere, which use is known to said Robert Munn Dixon and others of said East Orange.

Known to and publicly used by Edward N. Dickerson and Julius J. Suckert at New York, New York, and elsewhere, which use is known to said Edward N. Dickerson and Julius J. Suckert and others of said New York.

Known to and publicly used and sold by Angelo Rosso of 516 Elm Street, at St. Louis, Missouri, and elsewhere, which use is known to said Angelo Rosso and others of said St. Louis.

Known to and publicly used by dentists generally throughout the United States for more than two years prior to the filing of the application for the patent in suit, which use is known to Dr. Clarence De Witt Lukens, of St. Louis, Missouri, and by dentists generally.

Known to and publicly used and sold by Henry P. Deming at St. Louis, Missouri, and numerous other persons, at St. Louis, Missouri, and elsewhere, which use is known to said Henry P. Deming and others of said St. Louis.

11. This defendant, David Leon Soloman, denies that he has made and received large or any profits and advantages from infringement of said letters-patent and denies that complainants have suffered and sustained great or any loss and damage by reason of any acts of this defendant in violation of any alleged rights of complainants in connection with said letters-patent.

12. This defendant further states that the alleged invention of the Claude & Hess United States patent, No. 664,383, was patented to Georges Claude and Albert Hess by British patent No. 29,750 as of June 30, 1896, and as of a term beginning June 30, 1896, and expiring June 30, 1910, provided that all taxes thereon were regularly paid, as required by the laws of Great Britain; that, as granted, said British letters-patent would, in any event, have expired on June 30, 1910, but that for failure to pay the fifth year's tax said
248 British letters-patent lapsed on June 30, 1900, and thereupon terminated, and the subject-matter thereof became at once open to the public for its use; that said lapse of said British patent having occurred prior to the issuance of the United States patent No. 664,383, said United States patent was invalid and void from the beginning; and that even if said United States patent No. 664,383 had not been invalid and void from the date of its issuance, by reason of its having issued subsequent to the lapse of said British patent, its term expired not later than June 30, 1910, by reason of the cessation on that date of the term for which said British patent No. 29,750 of June 30, 1896, was originally granted, subject to the payment of taxes as aforesaid.

13. Defendant furthermore states that the same alleged invention as that of United States patent No. 664,383 was patented by the same patentees by letters-patent of the Republic of France, No. 257,679, dated June 30, 1896, for a term of fifteen years from June 30, 1896, providing that taxes thereon were regularly paid, as required by the French law, and provided further that other provisions of the French law were observed, and that the term of said French letters-patent expired June 30, 1911, and that, therefore, said United States patent No. 664,383 expired not later than June 30, 1911.

14. This defendant furthermore states that the same alleged invention as that of said United States Claude & Hess patent No. 664,383 was patented to the same patentees by letters-patent of the Empire of Germany No. 97,953, dated August 27, 1896, for a term of fifteen years from and after August 27, 1896, and that the term of said German patent No. 97,953 will expire by limitation and be at an absolute end on August 26, 1911, and that the claim of said German letters-patent No. 97,953 is the same as claims one, two, and five of the Claude & Hess United States patent No. 664,383, in addition to the invention described in the specification of both patents being the same.

15. This defendant furthermore states that the acts by defendants, or either of the defendants in this cause complained of by the bill of complaint herein, which acts have been solely of the corporation defendant herein and not of the individual defendant and which acts do not infringe any rights of complainants under the Claude & Hess patent No. 664,383 or otherwise, have taken place subsequent to the expiration of the Claude & Hess United States patent No. 664,383 by limitation of law to correspond to the term of said British patent No. 29,750 of June 30, 1896.

249 16. This defendant furthermore states that by reason of the expiration of the Claude & Hess United States patent No. 664,383 as aforesaid, the bill of complaint herein does not state a cause of action cognizable by a court of equity.

17. This defendant states that complainants are not entitled to remedy against this defendant, or against his co-defendant, by way of injunction.

18. This defendant further states that the Claude & Hess United States patent No. 664,383 is, and always has been, invalid and void and of no effect in law because of anticipation thereof by prior patents and publications published more than two years prior to the filing in the United States Patent Office of the application therefor and more than two years prior to the alleged making of said invention by said Claude & Hess.

19. This defendant denies that on or before March 1, 1897, Georges Marie Auguste Claude and Georges Albert Hess were the true, joint, original, and first inventors and discoverers of an improved apparatus for storing and distributing acetylene gas, such as described in United States patent No. 664,383 and furthermore denies that same was not known and used by others in this country before their alleged invention or discovery thereof and not patented or described in any printed publication in this and foreign countries before their alleged invention or discovery thereof and not more than two years prior to their application for letters-patent therefor in this country and that the same had not been in public use and on sale in this country for more than two years prior to their said application and that the same had not been abandoned and that the same had not been first patented or caused to be patented by the said alleged inventors and their legal representatives and assigns in a country foreign to the United States upon an application filed more than seven months prior to the filing of said application in this country and furthermore denies that said Claude & Hess made application for letters-patent of the United States on March 1, 1897, or at any time in accordance with the then existing laws of this country; and this defendant avers that on June 30, 1896, which is more than seven months prior to the filing by said Claude & Hess of application for the United States patent in suit, said Claude & Hess filed application for letters-patent of the Republic of France which issued thereon as No. 257,679, dated June 30, 1896, the term of which began to run on said June 30, 1896, the alleged invention of said French patent and of said patent in suit being the same; and

this defendant furthermore avers that thereafter said Claude
250 & Hess filed an application for a British patent for the same invention and claimed, under the British law, as the effective date of such application and the date from which the term of said British patent began to run, June 30, 1896, thereby making their application for said British patent the same as if filed on June 30, 1896, simultaneously with their application for said French patent, said British application eventuating in British patent No. 29,750 of June 30, 1896. This defendant furthermore avers that said Claude & Hess did abandon the subject-matter of the patent in suit and that the same was in public use and on sale in this country for more than two years prior to their application for the patent in suit and that the same was described in printed publications published before their alleged invention and discovery thereof and more than two years prior to their application for the patent in suit and that the same was known and that the same was used by others in this country before their alleged invention or discovery thereof.

20. This defendant states that he has no knowledge or information on which he can base a belief as to whether or not said Claude & Hess complied in all respects with the conditions and requirements of the laws of the United States and regulations of the Patent Office of the United States, as alleged in the second paragraph of the bill of complaint herein, and as to whether or not the United States patent No. 664,383 was signed, sealed, and executed in due form of law, and leaves complainants to make such proof thereof as complainants may deem proper.

21. This defendant says that he has no knowledge or information upon which he can base a belief regarding the allegations in the second and third paragraphs of the bill of complaint as to assignments affecting the title of said United States patent No. 664,383 or as to the effect of said alleged assignments, and, therefore, leaves complainants to make such proof thereof as they may deem proper.

22. This defendant states that he has no knowledge or information on which he can form a belief as to the allegations of the fourth paragraph of the bill of complaint herein regarding the alleged license by Commercial Acetylene Company or The Prest-O-Lite Company or as to the nature of said alleged license, and, therefore, leaves complainants to make such proof thereof as complainants may deem proper.

23. This defendant denies that The Prest-O-Lite Company has, at any time, been engaged in manufacturing devices and structures, such as described and claimed in the patent in suit No. 664,383,
and furthermore denies that said The Prest-O-Lite Company
251 has since October, 1904, or at any time manufactured and sold great numbers of said devices or any at all of said devices, but this defendant avers that the 500,000 tanks that the fifth paragraph of complainants' bill of complaint herein alleges that said The Prest-O-Lite Company has manufactured and sold have all been of a type and character different from the subject-matter of the patent in suit and not made in accordance therewith, and, if marked by complainants or either of them with the word "Patented" and the

date of the patent in suit, so marked improperly, because made not in accordance with the patent in suit, but in a form of construction unprotected by the patent in suit. This defendant furthermore avers that the subject-matter of the patent in suit has not been at all commercially sold or used and has not gone into extensive use and sale for any purpose. This defendant furthermore denies that complainants are able to meet the demand for apparatuses containing and embodying the alleged invention of the patent in suit and furthermore denies that complainants are able to meet the demand for the unpatented apparatus called "Prest-O-Lite" tanks that said complainant, The Prest-O-Lite Company, has been making and selling under the pretense that same are protected by the patent in suit.

24. This defendant denies that the alleged invention of the patent in suit has been of great or any benefit and advantage to the public and that the public has generally or at all acquiesced in the rights that complainants assert under the patent in suit, and defendant avers that the claims of complainants under the patent in suit have been successfully resisted in litigation and that at least one court has held that said patent has expired. This defendant denies that defendants have in any manner interfered with the enjoyment by complainants of any rights belonging to them.

25. This defendant denies that complainants have notified this defendant of its aforesaid letters-patent and furthermore denies that said notice has been in conformity with the requirements of the statutes in such cases made and provided and furthermore denies that complainants have warned or requested this defendant to desist from manufacture, use, and sale of articles containing the alleged invention of the patent in suit.

26. This defendant avers that the gas tanks of Fireball Gas Tank & Illuminating Company are manufactured in accordance with United States patent No. 987,000 dated March 14, 1911.

27. This defendant denies that either this defendant or his
252 co-defendant has made or used or sold any tanks which embody the subject-matter of the patent in suit. This defendant furthermore denies that complainants will sustain great or irreparable loss and injury, by reason of anything that has been done or will be done by this defendant or his co-defendant, and furthermore denies that any of his acts will have the effect to encourage and induce others to infringe the patent in suit.

28. This defendant having fully answered to said bill of complaint, in so far as he is advised that the same is material and proper to be answered unto, denies each and every allegation thereof not expressly admitted herein, and denies that said complainants are entitled to the relief, or any part thereof in the said bill of complaint demanded, or to any relief whatsoever, prays the same advantage of his aforesaid answer as if he had pleaded or demurred to the said bill of complaint, and prays to be hence dismissed with his reasonable costs and charges in this behalf most wrongfully sustained.

(Signed) DAVID LEON SOLOMAN.

(Signed) HUGH K. WAGNER,
Solicitor and Counsel for Defendant.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

David Leon Soloman, being duly sworn, on his oath states that he is one of the defendants named in the bill of complaint in the above-entitled cause; that he has read the foregoing Answer and knows the contents thereof; that the facts therein stated are true of his own knowledge, except those therein stated on information and belief, and, as to those, he believes same to be true.

(Signed) DAVID LEON SOLOMAN.

Sworn to and subscribed before me this 21st day of August, 1911. My term expires May 8, 1915.

[SEAL.] (Signed) GLADYS WALTON,
Notary Public.

253 In the Circuit Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri.

In Equity. No. 5979.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Complainants,
v.
FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Respondents.

Return of Respondents on Order to Show Cause.

Now come respondents in the above-entitled cause and make the following return to the Court upon the order, dated — ——, 1911, signed by Hon. —— ——, Judge, to show cause why injunction pendente lite should not issue in this cause as prayed:

1. Respondents respectfully show unto this Honorable Court that they have, by their solicitor, entered their general appearance in this cause in lieu of doing so on October 2, 1911, as commanded by the subpœna in chancery in this cause and as respondents were entitled to do under the rules of this Court; by which early appearance of respondents, this cause will be expedited more than one month.

2. Furthermore, respondents show unto this Honorable Court that they have prepared their separate answers in this cause, and have filed same on August 21, 1911, and that said answers are sworn answers, denying both the validity of the Claude & Hess patent No. 664,383 sued upon by complainants in this cause and the allegation of infringement thereof by respondents; and respondents show to this Honorable Court that by their said action in thus early filing of their answers in this cause, instead of on November 6, 1911, as is their right under the rules of this Court, respondents have expedited this cause by more than two months.

3. Respondents furthermore show to this Honorable Court that the said letters-patent to Claude & Hess sued upon in this cause, No. 664,383, dated December 25, 1900, are invalid with respect to Claims 1, 2, and 5.

4. Respondents furthermore show to this Honorable Court
254 that if it were conceded that said Claude & Hess patent No. 664,383 were valid, then, and in that event, respondents have not infringed the same.

5. Respondents furthermore show unto this Honorable Court that whatever they have done of which complaint is made in this cause by complainants was so done by respondents under advice of counsel, Hugh K. Wagner, Esq., of St. Louis, Missouri, a specialist in patent law, and in the full and true belief of respondents that what they have done they were and are as lawfully entitled to do as every man in the world is entitled to breathe the air that surrounds the earth.

6. Respondents furthermore show that they believe in the most emphatic way that they have a meritorious defense to this cause, and that they will succeed thereon at final hearing, and that this Court and the United States Circuit Court of Appeals for the Eighth Circuit will decide that the patent sued upon is invalid and that respondents have not infringed same.

7. Respondents further show to this Honorable Court that they will in the defense of this cause produce and invoke numerous defenses which have never been made before in any Court in any litigation relating to said Claude & Hess patent No. 664,383 and particularly that they will produce and invoke defenses and anticipatory matter which were not before the United States Circuit Court for the Eastern District of Wisconsin in the case of Commercial Acetylene Company v. Avery Portable Lighting Company involving the same patent or before the United States Circuit Court at Detroit in the case of Commercial Acetylene Company and The Prest-O-Lite Company v. Acme Acetylene Appliance Company; and respondents further show that in their opinion said new defenses and said new anticipatory matter, consisting largely of prior domestic and foreign patents and printed publications, are of such a character that, if same had been before said United States Circuit Court for the Eastern District of Wisconsin and said United States Circuit Court at Detroit in said case last mentioned, an entirely different result would have been reached in those cases, and that both said courts would have declared said Claude & Hess patent invalid and not infringed.

8. Respondents furthermore make the contents of all the patents, both domestic and foreign, and of the printed publications set up in their answer in this cause, part of their return to said order to show cause.

9. Respondents furthermore file, herewith, affidavits of Percy B. Hills, William B. Potter, Calvin M. Woodward, Henry P.
255 Deming, William Phillips Thompson, Orville Sprecher, Angelo Rosso, August Seim, O. C. Raines, Harry S. Sanderson, James H. Smith, Leon Harrison, Alfred Ramel, George G. Lit-

tle, Herman Born, Clarence De Witt Lukens, and others as part of their return on said order to show cause.

10. Respondents furthermore show to this Honorable Court that, as they are advised and believe, the Claude & Hess United States patent No. 664,383 expired on June 30, 1910, by reason of the expiration on that date of the term for which the corresponding British patent No. 29,750 of 1896 was granted; and respondents, furthermore, show that French patent No. 257,679, dated June 30, 1896, and its certificates of addition, granted to Claude & Hess for the same subject-matter as the patent in suit United States patent No. 664,383, expired June 30, 1911, whereby the patent in suit expired not later than June 30, 1911; and respondents, furthermore, show that German patent No. 97,953 was granted to said Claude & Hess on August 27, 1896, for precisely the same subject-matter as that of the patent in suit, especial regard being had to claims 1, 2 and 5 of the patent in suit, and that said German Claude & Hess patent expired on August 26, 1911, and, therefore, that the patent in suit expired not later than midnight, August 26, 1911; and respondents, furthermore, show that said French and German Claude & Hess patents have expired so recently as not to have been before any court for adjudication and, therefore, constitute new defenses not available to any previous defendant in litigation under the patent in suit and on account of their cogency and pertinency adequate grounds by themselves for denying a motion for injunction pendente lite.

FIREBALL GAS TANK & ILLUMINATING COMPANY,
By DAVID LEON SOLOMAN, *President.*

256 UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

David Leon Soloman, being duly sworn, on his oath states that he is the president of Fireball Gas Tank & Illuminating Company, one of the respondents in the above-entitled cause; that he has read the foregoing return on the rule to show cause why injunction should not issue pendente lite therein; and that the statements therein contained are true.

(Signed) DAVID LEON SOLOMAN.

Sworn to and subscribed before me this — day of ——, 1911.
My term expires May 8, 1915.

(Signed) GLADYS WALTON,
Notary Public.

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

David Leon Soloman, being duly sworn, on his oath states that he is one of the respondents in the above-entitled cause; that he

has read the foregoing return on the rule to show cause why injunction should not issue pendente lite therein; and that the statements therein contained are true.

(Signed) DAVID LEON SOLOMAN.

Sworn to and subscribed before me this — day of ——, 1911.
My term expires May 8, 1911.

(Signed) GLADYS WALTON,
Notary Public.

(Here follows Exhibit No. 28, marked pages 257 to 262.)

257

No 5979
Ges. betr. Patente
Gesuch Bauer and
für Carbon Damen
Pfd Carbon Incand
Deutsche Gasglühl
& Elektr
Gemma Ges. m.b.H.
Köln Ehrenfeld
Comp. Gemma
Urkunde für Patent
ang. Verfahren
Defendants Exhibit No 28

Beschreibung

Daß das angeheftete Exemplar der Patentschrift mit demjenigen übereinstimmt, welches der Patenturkunde betreffend das Patent 97953 beigefügt worden ist, wird mit dem Hinzufügen bescheinigt, daß das Patent vom 27. August 1896 ab läuft und längstens bis zum 26. August 1911 dauert. Das Patent ist inzwischen auf die "Autogen" Werke für autogene Schweißmethoden G. m. b. H. in Berlin umgeschrieben worden.

Berlin, den 27. April 1911.

Der Präsident
des Kaiserlichen Patentamts.

(SEAL.)

C. 6320. VI/26. b.

KAISERLICHES PATENTAMT.

AUSGEGEBEN DEN 28. JUNI 1898.

PATENTSCHRIFT

— № 97953 —

KLASSE 26: GASBEREITUNG UND -BELEUCHTUNG.

GEORGES CLAUDE IN SAINT-MANDE
UND ALBERT HESS IN PARIS.

Anwendung von mit Acetylen beladenen Flüssigkeiten zur Nutzbarmachung von Acetylen.

Patentirt im Deutschen Reiche vom 27. August 1896 ab.

Bei den bisher üblichen Verfahren zur Aufspeicherung und Nutzbarmachung von Acetylen wurde das Gas entweder nur comprimirt oder zur Verflüssigung gebracht; im ersteren Falle kann man das Volumen nur ungefähr proportional dem angewendeten Druck verkleinern, im letzteren Falle bringt man allerdings das Volumen auf das kleinste Maß, aber die erforderliche Pressung ist außerordentlich groß und verändert sich wesentlich mit der Temperatur des Gases.

Nach vorliegendem Verfahren vermag man durch einfache Compression eine verhältnißmäßig bedeutende Volumenverminderung zu erzielen, ohne so hohe Pressungen anwenden zu müssen, wie sie zur Verflüssigung des Gases nothwendig sind. Das Acetylen wird von gewissen Flüssigkeiten aufgenommen, und zwar um so mehr, je höher der Druck ist, unter welchem sich das Acetylen und die Flüssigkeit befindet. Das Gas wird daher nach dem vorliegenden Verfahren unter Druck mit den zur Absorption geeigneten Flüssigkeiten (unter Zuhülfenahme von Drucküberschreitung, Bewegung, Abkühlung u. s. w.) in innige Berührung gebracht, um von der Flüssigkeit in möglichst großer Menge aufgenommen zu werden. Die mit Acetylen gesättigte Flüssigkeit wird dann in gegen den Druck genügend widerstandsfähige Gefäße gebracht.

Zur Absorption des Acetylens sind besonders geeignet: die verschiedenen Alkohole, namentlich Methylalkohol, Aethylalkohol, Amylalkohol, ferner Benzol, Toluol, Xylol, Essigsäure, Aceton, Steinöle, Chloroform u. s. w. Der aufgewendete Druck kann beliebig sein; zweckmäßigerweise beträgt derselbe 5 bis 20 Atmosphären und darüber. Vor der Absorbirung kann man das Acetylen durch geeignete Flüssigkeiten durchtreten oder über geeignete Stoffe ziehen lassen, um es von seinen Unreinigkeiten zu befreien.

Die zur Aufnahme der mit Acetylen gesättigten Flüssigkeit dienenden Gefäße sind mit einem Hahn oder Ventil versehen, aus dem das Gas nach Maßgabe der auftretenden Druckabnahme entweicht und dann zu den üblichen Zwecken gebraucht werden kann. Ist die zur Aufnahme des Acetylens benutzte Flüssigkeit flüchtig, so wird beim Freiwerden des Gases eine gewisse Menge der Flüssigkeitsdämpfe mitgerissen werden. In den Fällen, in denen diese Beimengung schädlich oder unerwünscht ist, wird in die Leitung zwischen dem Behälter und dem Verbrauchsapparat (je nach der Beschaffenheit der mitgerissenen Flüssigkeitsdämpfe) ein Condensir- oder Waschapparat eingeschaltet.

Einige von den zur Anwendung kommenden Flüssigkeiten sind brennbar. Die von dem

(2. Auflage, ausgegeben am 26. Oktober 1907.)

Acetylen mitgerissenen Dämpfe derselben sind aber in gewissen Fällen für Beleuchtungszwecke mehr nützlich als schädlich, so daß man sie nicht zu entfernen braucht.

Da sich der Druck des Gases während seines Entweichens aus der Absorptionsflüssigkeit vermindert, so schaltet man dort, wo ein constanter Druck erforderlich ist, einen Druckminderer oder Druckregler beliebiger Construction ein.

Es wird also als Mittel zur Aufspeicherung von Acetylen in großer Menge unter kleinem Volumen das große Absorptionsvermögen gewisser Flüssigkeiten benutzt, ein Vermögen, welches mit dem Druck beträchtlich zunimmt Es wird dadurch die Anwendung von leichten, transportfähigen Behältern ermöglicht, welche mit Flüssigkeit angefüllt werden und wieder verwendet werden können.

Da das Gewicht der Behälter verhältnißmäßig gering ist, so kann bei gewöhnlichen Größenverhältnissen mehr Acetylen auf die Einheit des Gesammtgewichtes aufgespeichert werden, als es die gewöhnlichen Methoden, wie einfache Druckerhöhung oder Verflüssigung, erlauben. Als Beispiel hierzu sei ein Behälter von 1 l Inhalt genommen. Wenn in einen solchen Behälter Acetylen bis zu einem Druck von 12 Atmosphären hineingebracht wird, so nimmt das Gefäß ungefähr 12 l dieses Gases auf. Füllt man nun diesen Behälter mit einer geeigneten Flüssigkeit, z. B mit Aceton, dessen Absorptionsvermögen sehr groß und dessen Preis gering ist, so werden in diesem Gefäß bei einem Druck von nur einer Atmosphäre ungefähr 25 l Gas aufgespeichert. Wenn nun noch der Druck bis auf 12 Atmosphären erhöht wird, wie in dem oben angeführten Beispiel, so speichert man in diesem nur 1 l Aceton enthaltenden Behälter ca. 300 l Acetylen auf. Folglich hat man 25 mal mehr, als in dem Falle, wo der Behälter keine Flüssigkeit enthielt und unter einem Druck von 12 Atmosphären nur 12 l Acetylen aufnehmen konnte.

Vergleiche man jetzt noch an diesem Beispiel die erlangten Ergebnisse. Im ersten Falle (wenn man Beleuchtungszwecke im Auge hat) kann man einen 15kerzigen Brenner während ungefähr einer Stunde speisen, während in dem Falle, wo der Behälter mit Aceton gefüllt ist, dieselbe Lichtstärke während 25 Stunden erhalten wird. Der so erhaltene gewerbliche Vortheil ist unbestreitbar und das Ergebniß ist gänzlich neu.

Aber außer diesem Vortheil kann man deren andere, nicht minder große anführen. So ist das beschriebene Mittel das einzige, welches ermöglicht, so große Mengen Acetylen unter so geringem Volumen und Druck aufzuspeichern. Daraus folgt auch, daß die Behälter weniger stark zu sein brauchen, als diejenigen für flüssiges Acetylen, und bei eingehenden Versuchen ist man zu folgenden Vergleichsresultaten gelangt:

Während man in einem Behälter von 2 l Gehalt ungefähr 100 l Acetylen für jedes Kilogramm des Gesammtgewichtes aufspeichert, wenn das Gas nach dem gewöhnlichen Vorgehen verflüssigt wird, so werden nach dem vorliegenden Verfahren 130 l auf jedes Kilogramm aufgespeichert. Es muß hierzu bemerkt werden, daß der Druck des flüssigen Acetylens bei gewöhnlicher Temperatur 25 Atmosphären beträgt, während bei dem vorliegenden Verfahren der Druck im angenommenen Beispiel nur etwa 12 Atmosphären erreicht.

Andere Merkmale der Neuheit sind noch folgende: Wie schon erwähnt, übt das flüssige Acetylen einen Druck von etwa 25 Atmosphären bei gewöhnlicher Temperatur (20° C) aus. Wenn aber die Temperatur 37,5° C. übersteigt, so erhebt sich der Druck bis zu etwa 70 Atmosphären. Nach dem vorliegenden Verfahren, wo das gelöste Acetylen bei 20° C. unter 12 Atmosphären Druck steht, wächst dieser Druck, wenn die Temperatur auf 37,5° C. steigt, nur bis auf ungefähr 20 Atmosphären Diese neue Thatsache ist sehr wichtig, weil sie ermöglicht, dünnwandige und deshalb leichte Behälter anzuwenden.

Ein anderes, gewerblich neues Ergebniß beruht auf der Thatsache, daß die Lösung des Acetylens in Flüssigkeit seine Explosionsfähigkeit beträchtlich vermindert. Die Zersetzungstemperatur der Masse ist viel niedriger, und dieser Umstand macht die industrielle Ausnutzung des Acetylens weniger gefährlich.

Die Absorption des Acetylens kann durch irgend eines der in der Industrie für ähnliche Verhältnisse bekannten Verfahren bewirkt werden, z. B. durch ein der Herstellung des künstlichen Selterswassers entsprechendes Verfahren. Als Beispiel wird im Folgenden eine Einrichtung beschrieben, mit deren Hülfe sich das Verfahren der Aufspeicherung ausführen läßt. Es sei jedoch bemerkt, daß das Verfahren keineswegs an die beschriebenen und dargestellten Apparate gebunden ist.

Fig. 1 der Zeichnung zeigt die Grundzüge der Einrichtung.

Das auf bekanntem Wege hergestellte, gewaschene und gereinigte Acetylen wird bei *a* von der Pumpe *P* angesaugt, welche es bei geöffnetem Hahn R^1 in den theilweise mit der Absorptionsflüssigkeit gefüllten Behälter *A* drückt. Das Acetylen tritt unter Druck durch die innere Düse eines Zerstäubers *J* aus und saugt die Flüssigkeit an, welche mit Gas gemischt in feinen Tröpfchen niederfällt. Die Wirkung des

Apparates kann dadurch zu einer ununterbrochenen und selbstthätigen gemacht werden, daß man eine Pumpe anwendet, die zu arbeiten aufhört, sobald der Druck die Grenze erreicht hat, bei welcher man die Flüssigkeit sättigen will. Dadurch, daß die Flüssigkeit in Staubform durch das im oberen Theil des Behälters *A* enthaltene Gas hindurchgeschickt wird, sättigt sie sich mit Gas. Zieht man nun aus dem Behälter *A* eine gewisse Menge gesättigter Flüssigkeit ab und führt eine entsprechende Menge ungesättigter Flüssigkeit ein, so mischt sich die letztere mit der gashaltigen Flüssigkeit im Behälter *A* und sättigt sich nach und nach. Wenn man also die Leistung der Pumpe regelt, so kann man in dem Behälter beständig Flüssigkeit von demselben mittleren Sättigungsgrade halten. Anstatt das Gas mittels einer Pumpe unter Druck in den Zerstäuber *J* zu bringen, kann man auch unmittelbar den Druck des Apparates benutzen, in welchem das Acetylen etwa durch Einwirkung von Wasser auf Calciumcarbid gebildet wird, oder man benutzt z. B. den Druck aus einem Behälter mit flüssigem Acetylen.

Der Behälter *B* enthält Vorrath an nicht gesättigter Absorptionsflüssigkeit. Dieser Behälter wird, um das Eindringen von Luft zu vermeiden, bei geschlossenen Hähnen R^2 R^4 und offenem Hahn R^3 durch den Trichter so weit gefüllt, bis der Flüssigkeitsspiegel bis in den Trichter reicht; darauf wird der Hahn R^3 geschlossen. Um als Ersatz für etwaige Verluste frische Flüssigkeit vom Behälter *B* in den Behälter *A* gelangen zu lassen, öffnet man die Hähne R^2 R^4; ist der gewünschte Flüssigkeitsstand erreicht, so schließt man dieselben wieder Da nach Entleerung der Flüssigkeit der Behälter *B* Acetylen von gleicher Spannung wie im Behälter *A* enthält, so öffnet man vor dem Wiederfüllen des ersteren einen Augenblick den Hahn R^5, so daß der Ueberschuß an Gas in das Saugrohr der Pumpe entweichen kann. Auf diese Weise wird der beim Wiederfüllen des Behälters *B* eintretende Gasverlust vermindert.

Wenn die Flüssigkeitsbehälter von den Kunden mit verbrauchter Flüssigkeit zurückkommen, so enthält diese Flüssigkeit nur so viel Gas, wie bei atmosphärischem oder ganz wenig höherem Druck absorbirbar ist. Es handelt sich dann darum, diese verbrauchte Flüssigkeit durch gesättigte zu ersetzen. Zu diesem Zweck befestigt man die beiden Rohrmündungen des Gebrauchsgefäßes *r* mittels Verschraubungen oder dergl. in t^1 t^2 und öffnet die Hähne R^3 und R^4; alsdann fließt die verbrauchte Flüssigkeit infolge der Heberwirkung aus dem Gebrauchsgefäß durch das den Hahn R^4 tragende Rohr in den Behälter *A*. Schließt man darauf die Hähne R^3 und R^4 wieder, so bleibt das Gefäß *r* mit Gas von der im Behälter *A* herrschenden Spannung gefüllt; den Drucküberschuß schafft man dadurch fort, daß man durch Oeffnen des Hahnes R^7 eine Verbindung mit dem Saugrohr der Pumpe herstellt. Ist dieser Hahn dann wieder geschlossen, so tritt bei geöffnetem Hahn R^4 gesättigte Flüssigkeit aus dem Behälter *A* in das Gefäß *r*; dieses füllt sich nicht vollständig mit Flüssigkeit, es bleibt vielmehr oberhalb der Flüssigkeit eine gewisse Menge comprimirten Gases. Verschließt man jetzt die beiden Rohrmündungen durch Absperrhähne oder -Ventile und löst die Verbindungen t^1 und t^2, so ist das Gefäß oder die Flasche *r* wieder gebrauchsfertig.

In Fig. 2 ist als Beispiel eine Ausführungsform einer solchen Acetylenflasche dargestellt. Die Flasche, welche beliebig gestaltet sein kann und eine gegen starken Druck widerstandsfähige Wandung haben muß, ist mit einem durch einen Hahn *R* absperrbaren Rohransatz *T* versehen und besitzt ein inneres, fast bis auf den Boden reichendes Rohr *t*, dessen oberes, rechtwinklig abgebogenes Ende *o* durch eine seitliche Oeffnung aus der Flasche heraustritt und durch ein unter Federdruck stehendes Rückschlagventil *s* abgesperrt wird. Befestigt man die Flasche zwecks Wiederfüllung mittels der Verschraubungen t^1 und t^2 (Fig. 1), so dringt eine concentrisch an der Verschraubung t^1 angeordnete Nadel in die Mündung *o*, hebt das Ventil *s* von seinem Sitz und hält dasselbe während des Entleerens und Wiederfüllens der Flasche offen. Man kann jedoch auch eine einfachere Flasche mit nur einer Rohrmündung und einem Hahn oder Ventil anwenden, welche in der Weise entleert wird, daß man sie umgekehrt auf den Trichter des Behälters *B* setzt und so die Flüssigkeit unter dem geringen Ueberdruck, welcher in der Flasche herrscht, ausfließen läßt. Um diese Flasche wieder zu füllen, schraubt man sie, wie in Fig. 1 dargestellt ist, mittels einer geeigneten Verbindung t^3 auf das Ende eines in den Behälter *A* mündenden Rohres. Oeffnet man dann den Hahn R^9, so steigt die gesättigte Flüssigkeit in die Flasche, indem sie den Rest des in derselben befindlichen Gases comprimirt. Aus der Flasche wird das Gas beim Gebrauch durch den Rohransatz *T* entnommen. Bei dem angegebenen Verfahren der Füllung kann in die Flasche keine Luft eintreten, so daß explosive Gemische nicht entstehen können, und da außerdem die Spannung eine mäßige ist, ist die Handhabung durchaus gefahrlos. Derselbe Zweck kann auch dadurch erreicht werden, daß die absorbirende Flüssigkeit unmittelbar in der Flasche selbst, durch Zuleitung des Acetylens unter Druck, gesättigt wird, sowie

POOR COPY

auch dadurch, daß die absorbirende Flüssigkeit mit dem zur Zersetzung des Carbids unter Druck dienenden Wasser gemischt wird.

Sollen die Flaschen bei tragbaren Lampen in Anwendung kommen, so werden sie so ausgebildet, daß sie in den Fuß einer derartigen Lampe hineinpassen.

Falls es erforderlich ist, das Gas unter constantem Druck der Flasche zu entnehmen, so schaltet man, wie bereits erwähnt, einen Druckregler ein, und zwar kann man das Acetylen einfach in einen Gasometer leiten, oder man ordnet unmittelbar über dem Gasaustritt einen der vielen bekannten Druckminderer an. Ueberhaupt sind die im Vorstehenden beschriebenen und in Fig. 1 und 2 dargestellten Apparate nur beispielsweise zur Erläuterung des Verfahrens angeführt und ist das letztere unabhängig von den angegebenen Ausführungsformen.

PATENT-ANSPRUCH

Die Anwendung von mit Acetylen unter Druck beladenen Flüssigkeiten zwecks Nutzbarmachung von Acetylen für Beleuchtung, Kraftbetrieb, Heizung und dergl., dadurch gekennzeichnet, daß das Acetylen unter Druck von einer geeigneten Flüssigkeit absorbirt und die mit Acetylen gesättigte Flüssigkeit in passenden Gefäßen aufbewahrt wird oder enthalten ist, aus welchen das Acetylengas, zweckmäßig unter Einschaltung eines Druckreglers, dem Verbrauch zugeführt werden kann.

Hierzu 1 Blatt Zeichnungen.

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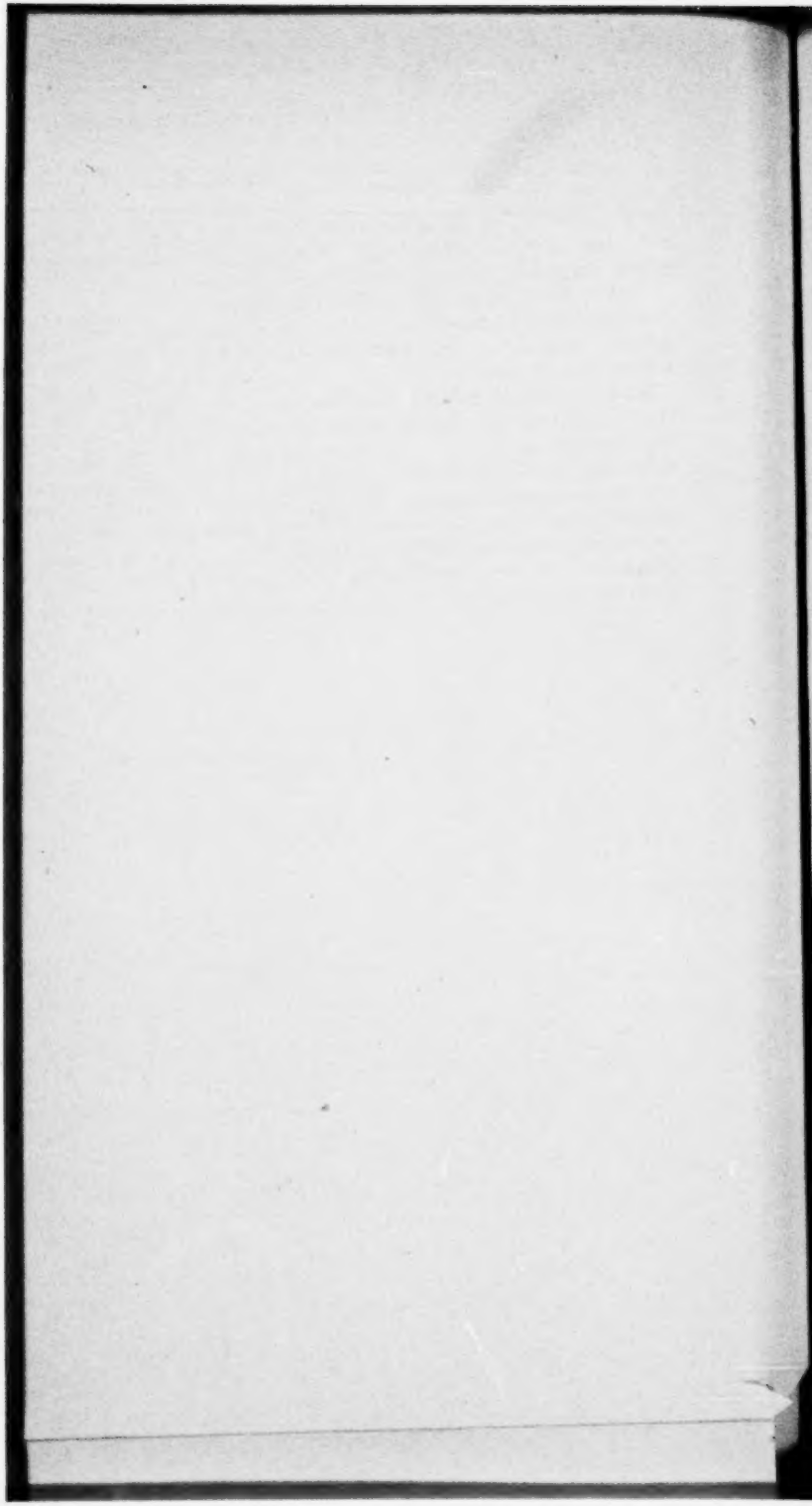


262

GEORGES CLAUDE IN SAINT-MANDE UND ALBERT HESS IN PARIS.

Anwendung von mit Acetylen beladenen Flüssigkeiten zur Nutzbarmachung von Acetylen.

Fig. 1.

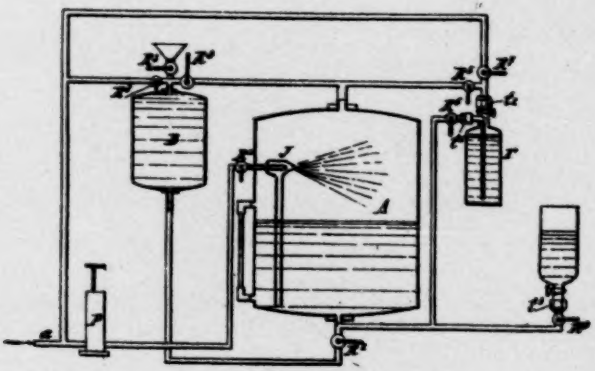


Fig. 2.

Zu der Patentschrift

№ 97953.

PHOTOGR. DRUCK DER REICHSDRUCKEREI

263 DEFENDANTS' EXHIBIT No. 33.

Certificate.

That the appended copy of the patent specification agrees with that which has been annexed to the Letters Patent relating to the patent 97,953 is certified with the additional remark that the patent runs from the 27th August, 1896, and lasts at longest until the 26th August, 1911. The patent has in the meantime been transferred to the "Autogen" werke für autogene Schweissmethoden G.m.b.H. of Berlin.

Berlin, the 27th April, 1911.

THE PRESIDENT
Of the Imperial Patent Office.

C. 6320 VI/26b.

Imperial Patent Office.

Patent Specification No. 97953.

Class 26: Gas Preparation and Illumination.

Issued June 28, 1898.

Georges Claude of Saint-Mandé and Albert Hess of Paris. Employment of Liquids Charged with Acetylene for Utilising Acetylene.

Patented in the German Empire from the 27th August, 1896.

In the processes customary heretofore for storing and utilising acetylene the gas was either only compressed or liquefied; in the former case the volume can be diminished only approximately proportionally to the pressure employed, whilst in the latter case it is true the volume is reduced to the smallest amount, but the requisite pressure is exceedingly great and materially varies with the temperature of the gas.

According to the present process, a relatively considerable diminution in volume can be obtained by simple compression without having to employ such high pressures as are requisite for liquefying the gas. Acetylene is absorbed by certain liquids, to-wit: the more the higher the pressure is to which the acetylene and the liquid are subjected. Therefore, according to the present process, the gas is brought under pressure into intimate contact with liquids suitable
264 for its absorption (with the aid of excess pressure, movement, cooling, etc.), in order that as large a quantity as possible may be absorbed by the liquid. The liquid saturated with acetylene is then put into vessels sufficiently capable of resisting the pressure.

For absorbing acetylene the following are specially suitable: the

various alcohols, particularly methyl alcohol, ethyl alcohol, amyl alcohol, also benzene, toluene, zylene, acetic acid, acetone, petroleum, chloroform, etc. The pressure employed may be as desired; preferably it amounts to upwards of 5 to 20 atmospheres. Before the absorption the acetylene is caused to pass through suitable liquids or over suitable materials in order to liberate it from its impurities.

The vessels for holding the liquid saturated with actylene must be provided with a cock or valve from which the gas escapes according to the diminution of pressure which occurs, and can then be used for the customary purposes. If the liquid used for absorbing the acetylene is volatile, when the gas is liberated a certain quantity of the vapour of the liquid will be entrained by it. In those cases in which this admixture is injurious or undesirable, a condensing or washing apparatus is connected into the pipe between the receptacle and the apparatus (according in each instance to the nature of the vapours which are entrained).

Some of the liquids which are employed are combustible. The vapours of the same entrained by the acetylene are, however, in certain instances more useful than injurious for purposes of illumination, so that they do not require to be removed.

As the pressure of the gas diminishes whilst escaping from the absorbent liquid, when a constant pressure is required a pressure-reducer or pressure-regulator of any desired construction is interpolated.

Consequently, as a means for storing acetylene in large quantities in a small volume, the great power of absorption of certain liquids is used, a power which considerably increases with the pressure. The employment of light, portable receptacles is thereby enabled, which are filled with liquid and can be employed again.

As the weight of the receptacle is relatively small, with ordinary sizes more acetylene can be stored per unit of the total weight than is allowed by the ordinary methods, such as simple increase of pressure or liquefaction. As an example of this a receptacle of 11. content may be taken. When acetylene is raised in such a receptacle to a pressure of 12 atmospheres, the litre absorbs about 12 l. of this gas. Now if this receptacle is filled with a suitable liquid, e. g., acetone, whose power of absorption is very great and its price
265 low, approximately 25 l. gas will be stored in this vessel at a pressure of only 1 atmosphere. Now if the pressure is increased to 12 atmospheres, as in the above example, about 300 l. acetylene are stored in this receptacle containing only 1 l. acetone. Consequently, one has 25 times more than in the case when the receptacle contained no liquid and could contain only 12 l. acetylene at a pressure of 12 atmospheres.

Now compare the results obtained in this example. In the former case (when illuminating purposes were in view) one 15 candle-power burner can be fed for approximately 1 hour, whilst in the case when the receptacle is filled with acetone the same light is obtained during 25 hours. The commercial advantage thus obtained is indisputable and the result entirely new.

Besides this advantage, however, others not less great can be ad-

vanced. The described means is the sole one which enables such large quantities of acetylene to be stored in such a small volume and at such a low pressure. It follows that the receptacles require to be less strong than those for liquid acetylene and the following comparative results have been arrived at after detailed tests:

Whilst about 100 l. acetylene is stored for each kilogramme of the total weight in a receptacle of 2 l. content, when the gas is liquefied according to the ordinary process, according to the present process 130 l. are stored for each kilogramme. It must be noted that the pressure of liquid acetylene at an ordinary temperature is 25 atmospheres, whilst in the present process the pressure in the example reached only about 12 atmospheres.

Other features of novelty are the following: As already mentioned, liquid acetylene exercises a pressure of about 25 atmospheres at an ordinary temperature (20°C.). When the temperature exceeds 37.5°C., however, the pressure rises to about 70 atmospheres. According to the present process, in which the dissolved acetylene at 20°C. is at 12 atmospheres pressure, when the temperature rises to 37.5°C. this pressure is increased to only about 20 atmospheres. This new fact is very important because it enables thin-walled and therefore light receptacles to be employed.

Another commercially new result is based on the fact that the dissolving of the acetylene in liquids considerably diminishes its capability of explosion. The temperature of decomposition of the mass is much less and this circumstance renders the industrial utilisation of acetylene less dangerous.

The absorption of the acetylene may be brought about by any process known in the industry for similar conditions, e. g., by a process corresponding to the manufacture of artificial soda-water. As an example, an apparatus is hereinafter described, with whose aid the storing process can be carried into practice. It may, however, be mentioned that the process is in no way limited to the apparatus described and shown.

266

Fig. 1 of the drawing shows the principal features of the apparatus.

The washed and purified acetylene made in known manner is sucked at *a* by the pump *p*, which forces it, when the cock R^1 is opened, into the receptacle A, partially filled with the absorption liquid. The acetylene issues under pressure through the inner nozzle of an atomizer J and sucks up the liquid which falls, mixed with gas, in fine drops. The action of the apparatus can be made continuous and automatic by employing a pump which stops working as soon as the pressure has reached the limit at which it is wished to saturate the liquid. Owing to the liquid being sent in the form of spray through the gas in the upper part of the receptacle A, it becomes saturated with gas. Now if a certain quantity of saturated liquid is drawn from the receptacle A and a corresponding quantity of unsaturated liquid introduced thereto, the latter is mixed with the gas-containing liquid in the receptacle A and gradually becomes saturated. Thus when the performance of the pump is regulated liquid of the same average degree of saturation can constantly be

had in the receptacle. Instead of sending the gas under pressure by means of a pump into the atomizer J, the pressure of the apparatus, in which the acetylene is formed—say, by water acting on calcium carbide—can be directly used, or the pressure of a receptacle containing liquid acetylene may, for example, be used.

The receptacle B contains a stock of non-saturated absorbent liquid. In order to prevent air entering into this receptacle it is filled through the funnel so full that the level of the liquid is in the funnel whilst the cocks R^2, R^4 are closed, and the cock R^3 is opened; the cock R^3 is then closed. In order to allow fresh liquid to pass from the receptacle B into the receptacle A to replace any loss, the cocks R^2, R^4 are opened; when the desired level of the liquid is obtained the same are closed again. As the receptacle B contains acetylene of the same pressure as in receptacle A after the liquid has been emptied, before refilling the first, the cock R^8 is opened for a moment so that the excess gas can escape into the suction pipe of the pump. In this manner the loss of gas whilst filling the receptacle B is diminished.

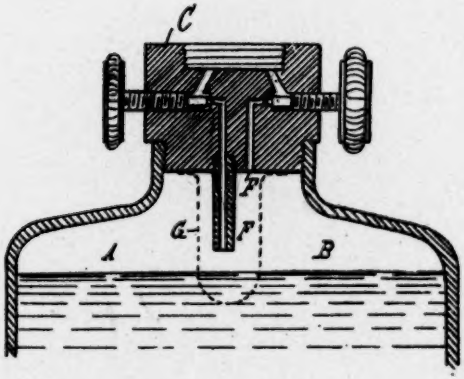
When the receptacles come back with used liquid from the customers this liquid contains only as much gas as is absorbable
267 at atmospheric or a very slightly higher pressure. It is then a matter of replacing this used liquid by saturated. For this purpose the two tubular mouths of the used vessel r are attached by means of couplings or the like at t^1, t^2 and the cocks R^5 and R^6 are opened; in consequence of the siphon action, the used liquid then flows out of the used vessel through the pipe having the cock R^6 into the receptacle A. When the cocks R^5 and R^6 are subsequently closed the vessel r remains filled with gas at the pressure existing in the receptacle A; the excess pressure is got rid of by opning the cock R^7 and establishing a connection with the suction pipe of the pump. After this cock has been closed again, when the cock R^8 is opened, saturated liquid passes out of the receptacle A into the vessel r: this does not completely fill with liquid, but a certain quantity of compressed gas remains above the liquid. If the two tubular mouths are now closed by stopcocks or valves and the connections t^1 and t^2 are broken, the vessel or the flask r is again ready for use.

In Fig. 2 one form of such an acetylene flask is represented as an example. The flask, which may have any desired shape and must have walls capable of resisting high pressure, is provided with a socket T, closable by a cock R, and an inner tube t; the latter extends almost to the bottom, and its upper end o bent at right angles issues through a lateral hole out of the flask and is closed by a spring-pressed non-return valve s. When the flask is connected for refilling it by means of the unions t^1 and t^2 (Fig. 1), a pin arranged concentrically at the union t^1 enters into the mouth o, lifts the valve s from its seat and holds the same open whilst the flask is emptied and refilled. A simpler flask having only one tubular mouth and one cock or valve can, however, be employed, and is emptied by its being placed reversed on the funnel of the receptacle B, thus allowing the liquid to issue under the small excess pressure which is in

Defendant's Exhibit No. 26a

(Drawing forming part of Defendant's Exhibit No. 26a, which is a certified copy of patent of addition dated June 11, 1897, to Claude & Hess French patent No. 257,679, dated June 30, 1896.)

FIG. I



Dessin annexé au
Certificat d'addition
pris le 11 Juin 1897
par MM. A. Claude et
Hess et se rattachant au
brevet N° 257.679

Paris, le 12 MAI 1911 Le Secrétaire Général de l'Office National de la Propriété Industrielle.

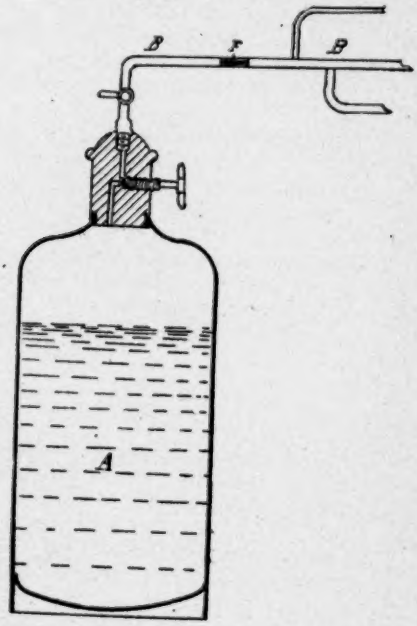
OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE

Defendant's Exhibit No. 26b

(Drawing forming part of Defendant's Exhibit No. 26b,)
(which is a certified copy of patent of addition)
(dated April 26, 1898, to Claude & Hess French pat-)
(ent No. 257,679 dated June 30, 1896.)

FIG. 1

FIG. 2



Defun annexé au
Certificat d'addition
pris le 26 avril 1898
par MM. Claude et
Hess et se rattachant au
brevet N° 257.679.

Paris le 12 MAI 1911
Le Sous-Directeur de l'Office
National de la Propriété Industrielle

the flask. In order to refill this flask, as shown in Fig. 1, it is screwed by means of a suitable union t^3 on the end of a pipe opening into the receptacle A. When the cock R^3 is opened the saturated liquid rises in the flask and compresses the residue of the gas therein. The gas is removed from the flask through the socket T when in use. In the described filling process no air can enter into the flask, so that explosive mixtures cannot be formed, and, in addition, as the pressure is moderate, the manipulation is entirely without danger. The same ends can also be obtained by the absorbent liquid being saturated directly in the flask itself by supplying acetylene under pressure, and also by the absorbent liquid being mixed with the water used for decomposing the carbide under pressure.

268 If the flasks are to be used with portable lamps they are so formed that they fit into the base of such a lamp.

In case it is necessary to withdraw the gas at constant pressure from the flask, as already mentioned, a pressure regulator is interpolated, namely, the acetylene may be simply conducted into a gasometer, or one of the many known pressure reducers is arranged directly over the gas outlet. Indeed, the apparatus described above, and shown in Figs. 1 and 2, are only given by way of example for explaining the process, and the latter is independent of the described constructional forms.

Patent Claim.

The employment of liquids charged with acetylene under pressure for the purpose of utilising acetylene for illumination, motive power, heating and the like, characterised by the acetylene being absorbed under pressure by a suitable liquid and the liquid saturated with acetylene being preserved or contained in suitable vessels, from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed.

(Here follow drawings marked pages 269 and 270.)

271 (*Affidavit of William B. Potter for Defendants.*)

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis, ss:

William B. Potter, being duly sworn, on his oath says:

I am the same William B. Potter who has heretofore made an affidavit in this cause, dated August 18, 1911.

I have made chemical investigations concerning the nature, qualities, and ingredients of "Terpeline." I have thoroughly tested it for acetone. In view of the statement in the affidavit of Theodore W. Smith, executed August 19, 1911, filed in this cause, I have thoroughly examined the contents of a "Fireball" tank, No. 1331, which is an ordinary standard "Fireball" tank, and find that there is no acetone present.

Affiant further states that "Terpeline" is a liquid which is not only not acetone and contains no acetone, but differs greatly from acetone. It is a greater solvent than acetone for acetylene, of much higher specific gravity, viz., 1.14, as compared with .792 for acetone—i. e., distinctly heavier than water, whereas acetone is much lighter than water. "Terpeline" boils at a temperature of 176° F., while acetone boils at 138° F., or thirty-eight degrees below "Terpeline." "Terpeline" is far less volatile than acetone, and is hardly inflammable at ordinary temperatures, while acetone is highly so. "Terpeline" burns with a smoky flame, while acetone burns with a clear white flame like alcohol, which, of course it resembles. "Terpeline" is distinctly more viscous and less mobile than acetone. It is practically insoluble in water, while acetone is readily soluble in all proportions in water.

With all these characteristic differences, the two liquids can not be mistaken for one another. Not only does "Terpeline" contain no acetone, but it does not contain any substance or substances which could by any means be converted into acetone under any conditions, which might result from the use of "Terpeline" as the solvent for acetylene, whether in tanks for the lighting of automobiles or otherwise.

The contents of "Fireball" tank No. 1331, when subjected to distillation, gave no distillate whatever at a temperature of 60° C. (140° F.), the temperature at which acetone distills being 55° to 59° C. (131° to 138° F.), and no distillate was obtained
272 until a temperature of 74° C. (165° F.) was reached, and then only an insignificent quantity, nor by the raising of the temperature to 85° C. (185° F.) was any further distillate produced. On the other hand, if acetone had been present, it would have been readily and completely distilled at a temperature of 59° C. (138° F.). There cannot, therefore, be any acetone present in the contents of said tank No. 1331.

Affiant states that on Saturday evening (October 21, 1911, he was at the office of Fireball Gas Tank & Illuminating Company, defend-

ant in this cause, located at 5010 Delmar Boulevard, St. Louis, Missouri, in connection with chemical work and investigations for said Fireball Gas Tank & Illuminating Company; that while he was present in said office of the defendant corporation a gentleman brought in a "Fireball" gas tank which, on later inspection, was found to bear the number 963; that as soon as said tank was brought into the office of Fireball Gas Tank & Illuminating Company some one present remarked that "That tank looks as if it had been through the war"; that thereupon inspection was made by all present, including affiant, of the number on said tank, which said number was found to be 963. Upon close inspection of said tank No. 963 I found that it had scratched upon it the initials "T. M." Below these initials on said tank were some additional scratches—altogether making up the mark that Theodore du Moulin in his affidavit in this cause dated June 13, 1911, says he placed upon the tank that he delivered to Dr. Frederick W. Russe. Affiant states that the gentleman who brought said tank No. 963 to the office of said Fireball Gas Tank & Illuminating Company, as hereinabove stated, said that he had bought said tank for $20 from Dr. Frederick W. Russe, and that said Dr. Frederick W. Russe is an employee of Mallinckrodt Chemical Works, of St. Louis, Missouri. Mr. David Leon Soloman, President of defendant corporation had in his hands at the time when said tank No. 963 was brought to the office of the Fireball Company, as aforesaid, the original records of Fireball Gas Tank & Illuminating Company showing that "Fireball" tank No. 963 was one of three tanks sold on June 3, 1911, to Theodore du Moulin. Examination of said tank showed that the plug at one end thereof had manifestly been removed for some purpose, said plug being the one that connects with the needle valve of defendant's tank, and later replaced and sealed with red lead, some of said red lead having so run over the surface of the end of said tank as to attract attention thereto. Upon the request of Fireball Gas Tank & Illuminating Company, affiant took said tank No. 963 from the office of said Fireball Gas Tank & Illuminating Company to the laboratory of affiant for the purpose of making a physical and chemical investigation of its contents. Affiant states that from the time the gentleman brought said tank No. 963 into the office of said Fireball Gas Tank & Illuminating Company until affiant took it from said office to his own private laboratory said tank was never out of affiant's sight, and that its contents were untouched while in the office of said Fireball Gas Tank & Illuminating Company, and that the following contains a correct statement of the condition of the contents of said tank at the time said tank was received by affiant without change by anybody.

273

Affiant states that he began his examination of the contents of said tank first by smelling same and next by removing from the interior of said tank an adequate amount of the interior asbestos filler, naturally obtaining with the withdrawal of said quantity of said filler an average sample of the materials held absorbed in said asbestos filler.

Affiant states that very carefully and by repeated experiments and by various processes he tested the sample that he obtained, as aforesaid, from "Fireball" tank No. 963 for acetone; and, in brief, affiant states that acetone was absent therefrom.

Affiant states that the condition of the material within the tank was such as to show that it had been subjected to certain treatment within the tank prior to its having been received by affiant, which treatment had changed its condition from the condition of the contents of "Fireball" tank No. 1331 previously examined by affiant. The odor of the contents of said tank No. 963 when examined by affiant showed that ether had been introduced into said tank prior to its being received by affiant, the evident object of said use of the ether being to extract from said tank the solvent for acetylene gas contained therein or some portion of said solvent. Knowing the nature of the additional liquid thus introduced into the tank, and seeing that the object had been to remove from the tank some of the solvent for acetylene gas contained therein, affiant was able in his experiments to take that element into full consideration. The action of ether as an extractant under the circumstances stated was the same upon "Terpeline" as it would have been if acetone had been present in tank No. 963. Notwithstanding the use of ether as an extractant as aforesaid, I found within said tank and remaining therein a considerable amount of ether that had been introduced therein for the purpose of extracting the acetylene gas solvent and necessarily in solution therein some of said acetylene gas solvent, besides finding in the asbestos some of the original acetylene gas solvent un-
274 dissolved by said ether because not reached thereby. The fact that ether had been introduced into said "Fireball" tank No. 963 did not at all prevent my accurately and definitely ascertaining the nature of the acetylene gas solvent that had been originally placed in said tank, and the result of my tests showed that said solvent had not been acetone, but had been "Terpeline," the radically different nature of which I have hereinbefore explained.

I have been a practicing and consulting chemist in St. Louis and elsewhere for more than forty (40) years last past. It is well known in chemistry that the usual reactions for acetone are responded to by other substances not acetone and distinctly different from acetone. Unless this is thoroughly understood and the necessary precautions are taken, these other substances are surely to be mistaken for acetone. While there can be no doubt that "Terpeline" is not acetone and does not contain acetone, yet, on account of the above-mentioned fact that acetone reactions are sometimes responded to by other substances, it might be that Mr. Theodore W. Smith, of Indianapolis, was mistaken in thinking that he discovered the presence of acetone in "Fireball" tank No. 977, but further and thorough investigation of its contents would necessarily disclose the fact that the acetylene gas solvent is "Terpeline," and not acetone, and that they are distinctly different from each other, and that "Terpeline" is not the chemical equivalent for acetone.

WILLIAM B. POTTER.

Sworn to and subscribed before me this 23d day of October, 1911. My commission expires May 8, 1915.

[SEAL.] GLADYS WALTON,
Notary Public.

(*Affidavit of Dr. Herman H. Born for Defendants.*)

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis:

Dr. Herman H. Born, being duly sworn, on his oath states that he has read the affidavit of Theodore W. Smith, dated August 19, 1911, filed in this cause, and here repeats, the statements of his former affidavit executed August 18, 1911, in answer to the statements contained in said affidavit of Theodore W. Smith, and, also,
275 in answer to statements contained in the affidavit of Oramel H. Skinner, dated August 7, 1911, filed in this cause.

Affiant, however, adds this specific statement, after having read the statement of Theodore W. Smith that he found acetone in a "Fireball" tank, that "Terpeline" does not contain either acetone or alcohol as one of its ingredients, and is not, as compounded, either alcohol or acetone. Affiant states that "Terpeline" is a new chemical compound invented by affiant for Fireball Gas Tank and Illuminating Company, and that it possesses advantages and new functions over acetone and alcohol for the solution of acetylene gas and the holding of same for use in an automobile gas tank.

HERMAN H. BORN.

Sworn to and subscribed before me this 19th day of October, 1911. My commission expires May 8, 1915.

[SEAL.] GLADYS WALTON,
Notary Public.

(*Affidavit of Clarence De Witt Lukens for Defendants.*)

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis:

Clarence De Witt Lukens, being duly sworn, on his oath states that he is the same Clarence De Witt Lukens who made an affidavit in this cause, dated September 26, 1911. Affiant states that since making said affidavit he has read the affidavit of one Theodore W. Smith, dated August 19, 1911, filed in this cause, and that said affidavit of said Theodore W. Smith in its statement that by chemical analysis or otherwise said Theodore W. Smith found acetone in "Fireball" gas tank No. 977 is untrue, unless some one connected with complainants put acetone therein, for the reason that no acetone has ever been placed in any "Fireball" gas tank by Fireball Gas

Tank and Illuminating Company or any officer or employee of said Fireball Gas Tank & Illuminating Company.

Affiant states that he himself and Dr. Herman H. Born, who made an affidavit in this cause, dated August 18, 1911, and Hugh K. Wagner, Esq., counsel for defendants in this cause, are the only persons in the world who know the ingredients of "Terpeline," which is the solvent that Fireball Gas Tank & Illuminating Com-
276 pany uses for acetylene gas in its gas tanks, and that the formula has been correctly given by affiant to said Hugh K. Wagner, and that said Hugh K. Wagner knows that there is no acetone in "Terpeline." Affiant further states that "Terpeline" was invented by said Dr. Born, and the formula thereof communicated to affiant by said Dr. Born.

Affiant states that in the conduct of the business of Fireball Gas Tank & Illuminating Company affiant has charge of the manufacturing department and personally attends to putting together the ingredients that make "Terpeline" and that "Terpeline" is the solvent that has at any time been used by Fireball Gas Tank & Illuminating Company for acetylene gas. Affiant states that "Terpeline" does not contain acetone and that the combination of ingredients of which "Terpeline" is formed does not constitute acetone.

Affiant states that "Terpeline" is a compound of various different ingredients and that no one of these ingredients is acetone and that the names of these ingredients and the formula for compounding same to form "Terpeline" is a trade-secret and valuable property of Fireball Gas Tank & Illuminating Company and that, for that reason, he can not disclose the exact constituents of said compound. Affiant repeats, however, that no acetone is to be found in the solvent for acetylene gas that Fireball Gas Tank & Illuminating Company has at all times during its business used and which it now uses, and affiant adds that this is true, also, with respect to alcohol, the other solvent mentioned in the patent in suit, there being no alcohol in defendant's solvent and "Terpeline" not being alcohol.

Affiant says that his affidavit heretofore made in this case, dated September 26, 1911, constitutes an adequate denial of all other statements contained in said affidavit of Theodore W. Smith and the affidavit of Oramel H. Skinner, dated August 7, 1911, filed in this cause, and he herein now repeats the statements of his said affidavit of September 26, 1911, in answer to said affidavits of Skinner and Smith.

Affiant states that never at any time since the incorporation of Fireball Gas Tank & Illuminating Company has it or any one for it purchased any acetone, nor has Fireball Gas Tank & Illuminating Company any plant or apparatus adapted for the manufacture of acetone.

Affiant further states that he personally delivered to Professor William B. Potter, one of the experts in this case on behalf of defendants, an ordinary sample of defendant's solvent "Terpe-
277 line," being exactly such "Terpeline" as affiant regularly prepares for Fireball Gas Tank & Illuminating Company and has regularly prepared during all the business of said company, and

that the affidavit of Professor William B. Potter regarding the constituents of "Terpeline" is based upon exactly such "Terpeline" as defendant habitually uses and has used in its business as solvent for acetylene gas for its "Fireball" gas tanks.

In my affidavit of September 26, 1911, I said that "Some of complainant's affidavits speak of a needle valve as being a reducing-valve, because the opening of a needle valve allows some of the gas controlled thereby to escape, which, of course, results in the pressure in the remainder being lessened or decreased or reduced." To this I added: "To put such a statement into an affidavit can be only for the purpose of trying to mislead the court, as every one familiar with valves knows that a reducing-valve is a particular type of valve, just like a needle valve is a particular type of valve. In the sense in which complainants' said affidavits try to represent that a valve that allows some of the gas under pressure to escape, thereby lessening both the quantity and pressure of the gas that is left in the tank, is a reducing-valve, it would be equally correct to call it a lessening valve or a decreasing valve, and in that same sense it will be observed that the pinhole of this nitrous oxide tank is much more a reducing-valve or decreasing valve than is the mere needle valve of the 'Prest-O-Lite' or 'Fireball' tanks, as it serves as an auxiliary to the needle valve of the nitrous oxide tank for the purpose of lessening or decreasing or reducing the flow of gas permitted by said needle valve." These statements of mine referred to affidavits producing by complainants in the Chicago case—i. e., of the same complainants against Searchlight Gas Company; but I repeat them here against the misleading and misrepresenting statements contained in the affidavits of Oramel H. Skinner in this cause, executed August 7, 1911, and of Theodore W. Smith, executed August 19, 1911, both of which affidavits contain the same misleading statements and misrepresentations.

In reference to the statement in the affidavit of Oramel H. Skinner, executed August 7, 1911, about the so-called system of exchanges of full for empty "Prest-O-Lite" tanks, I desire to say that such system of exchanges of full for empty gas tanks containing compressed gas for various purposes was old many years before the date of the application for the patent in suit and was practiced with tanks of nitrous oxide gas, like that in evidence here marked Defendant's Exhibit Nitrous Oxide Tank, and that it was practiced, also, with tanks of gas for stereopticon exhibitions, like the
278 tank in evidence here marked Defendant's Exhibit Rosso Gas Tank, and that it was practiced, also, with seltzer water syphons, like the bottle in evidence here marked Defendant's Exhibit Bottle of Seltzer Water, said system of exchanges of full for empty receptacles having been practiced with all said kinds of receptacles and in many other arts for many years prior to the date of the application for the patent in suit.

Affiant further states that the pretended tabulation of the contents of "Fireball" gas tank No. 977 set forth in the above-mentioned affidavit of Theodore W. Smith on behalf of complainants is so inaccurate as to quantities, weights, etc., that it appears to be the

result of mere guess work. Affiant states that affiant knows exactly what weights and quantities of the various articles mentioned in said tabulation go into each and every "Fireball" gas tank, and that said tabulation so far varies from the standard quantities and amounts thus used in every instance by Fireball Gas Tank & Illuminating Company as to show that the examination of the contents of the "Fireball" gas tank No. 977 by Theodore W. Smith is entirely unreliable.

I personally delivered to Professor William B. Potter the "Fireball" gas tank No. 1331 referred to in his second affidavit (executed of even date herewith), and state that said "Fireball" tank so delivered to Professor Potter was an ordinary "Fireball" gas tank and as to its contents was identical at the time of delivery to Professor Potter with all the "Fireball" gas tanks that have been sold to any one by Fireball Gas Tank & Illuminating Company.

The affidavit dated June 3, 1911, of Theodore du Moulin filed on behalf of complainants in this cause states that said Theodore du Moulin on June 3, 1911, purchased from Fireball Gas Tank & Illuminating Company "Fireball" tanks numbered, respectively, 968, 977, and 979, but the records of Fireball Gas Tank & Illuminating Company show that said du Moulin did not purchase tank No. 968, but tank No. 963, and the contract relating to same attached hereto and marked Defendant's Exhibit du Moulin Contract shows that the numbers of the tank- purchased by Theodore du Moulin on June 3, 1911, were numbered, respectively, 963, 977, and 979. As "8" and "3" look more or less alike, Mr. du Moulin may have misread that number on the tank; but the fact is that he never received from Fireball Gas Tank & Illuminating Company tank No. 968, but he did receive tank No. 963.

On Saturday evening, October 21, 1911, after dark, a gentleman who owns an automobile called at the office of Fireball
279 Gas Tank & Illuminating Company, and brought with him said tank No. 963 that was sold to said Theodore du Moulin on June 3, 1911. The tank showed signs of peculiar usage, and inspection of the number thereon which was immediately made showed said number to be 963, and thus identified it with one of the three tanks sold to Theodore du Moulin on June 3, 1911. This naturally made defendants desire to have its contents analyzed by a chemist. One of defendant's experts, Professor William B. Potter, was present in the office of Fireball Gas Tank & Illuminating Company at the time said tank was brought in, and saw it when it was brought into the office of Fireball Gas Tank & Illuminating Company, and it did not leave his sight while it was in the office of Fireball Gas Tank & Illuminating Company, and was in no wise tampered with while there, and Professor Potter took it with him immediately to his laboratory for examination of its contents and such chemical analysis as was necessary for him to report upon the nature of its contents. His report on the contents of that tank will be found in his affidavit executed of even date herewith.

CLARENCE DE WITT LUKENS.

Sworn to and subscribed before me this 23d day of October, 1911. My commission expires May 8, 1915.

[SEAL.] GLADYS WALTON,
Notary Public.

(DEFENDANTS' EXHIBIT DU MOULIN CONTRACT.)

SAINT LOUIS, MISSOURI, 6-3-1911.

Received Fireball Gas Tank No. 977,—963—979 from Fireball Gas Tank & Illuminating Company for the personal use of T. du Moulin, subject to the following terms, conditions, restriction, and reservations of title, (to all of which said user hereby assents) namely:

Fireball Gas Tank & Illuminating Company hereby gives notice that this tank has not been sold by it outright, but subject to the following conditions, and it has reserved to itself, and hereby reserves, such title thereto that it retain the right to prescribe the retail price at which same shall be sold and the exclusive right to refill same with gas and to declare sale thereof at any other price or sale or use if refilled by any other person an unauthorized use of devices protected or about to be protected by patents issued to it and unauthorized use of the trade-mark "Fireball" and violation of property rights in said tank under said reservation of title
280 therein, and to declare sale or use of said tank to which a plate bearing this notice is attached at the time issued by it after removal or defacement or covering over of said plate a violation of its said patent, trade-mark, and property rights, and acceptance of this tank bearing this notice constitutes a contract by dealers that same shall be sold at retail only at the price of thirty dollars and by users that same will not be used if refilled by any one other than said Company, and retail sale at any other price will violate said contract and, also, constitute infringement of its said letters-patent and of the trade-mark "Fireball", and the use thereof when filled with gas by any one other than said Company will violate said contract and also constitute infringement of its said letters-patent and of its trade-mark "Fireball" and a trespass on its property rights under said reservation of title. Violation by either dealers or users of the rights of said Company under its said contract, reservation of title, trade-mark, or letter-patent will result in legal proceedings.

In consideration of the convenience that will be afforded said user by said Fireball Gas Tank & Illuminating Company in the exchange of empty "Fireball" gas tanks for charged "Fireball" gas tanks for the usual recharging price, said user hereby agrees that the foregoing notice, conditions, restrictions, and reservation of title shall apply to all other "Fireball" gas tanks that said user may at anytime receive as charged exchanges for said user's empty "Fireball" gas tanks.

[SEAL.] THEODORE DU MOULIN,
By —— ——.

Defendant's Exhibit du Moulin Contract.

(Affidavit of Joseph S. Soloman for Defendants.)

UNITED STATES OF AMERICA,
Eastern Division of the Eastern Judicial District of Missouri, State of Missouri, City of St. Louis:

Joseph S. Soloman, being duly sworn, on his oath states that he is an employee of Fireball Gas Tank & Illuminating Company, defendant in this cause, and that he is brother of David Leon Soloman, who is President of that company and the individual defendant in this cause. Affiant states that his age is twenty-four (24) years, and that he is a salesman for Fireball Gas Tank & Illuminating Company.

Affiant further states that, on reaching the office of said company on the morning of Saturday, October 21, 1911, he found in
281 his mail the attached letter marked Defendant's Exhibit letter to Joe Soloman. Affiant states that, also, hereto attached is the envelope in which said letter was received by him through the United States mail, said envelope being marked Defendant's Exhibit envelope for letter addressed to Joe Soloman.

Affiant states that said letter reads as follows:

"ST. LOUIS, Oct. 20/11.

DEAR JOE: I know your brother is heavily interested in the Fireball gas tank Co. and I want to tip you off that two men, who I understand are employed by the Prestolite Co. are putting some kind of fluid in the Fireball tanks I don't know what the object is but am sure it must be to hurt your light in some way.

Better be on the lookout I don't want to be mixed up in this but feel that your brother should know about it.

A. FRIEND."

Affiant states that when he looked at his mail and found in it this letter in the attached envelope, he attributed so little importance to it that he tore the envelope roughly and in half, as shown in the attached exhibit, and threw the pieces of said envelope in his waste-basket. When, however, he learned the nature of the communication inclosed in said envelope, he attached more importance to said envelope and offers it, herewith, in connection with the letter that he found in said envelope. Affiant states that he does not know who wrote said letter; that he knows that it was not written by any one connected with the Fireball Gas Tank & Illuminating Company; that said letter was evidently written by some one who did not understand the legal aspects of this case, but by some one who thought only of the commercial phase of the matter and who feared that financial injury from a commercial standpoint might result to Fireball Gas Tank & Illuminating Company. Affiant states that said Fireball Gas Tank & Illuminating Company has never purchased any acetone and does not use acetone as the solvent for acetylene gas in the "Fireball" tanks, but has always, on all occasions, used "Ter-

peline." Affiant can only suggest that if any one in the employ of The Prest-O-Lite Company has poured any kind of fluid into "Fireball" tanks, it is likely to have been acetone, and so inserted therein for the purpose of manufacturing evidence against defendants by making it appear that "Fireball" tanks contain acetone, whereas, as a matter of fact, what Fireball Gas Tank & Illuminating Company puts in its tanks is "Terpeline" and not acetone.

JOSEPH S. SOLOMAN.

282 Sworn to and subscribed before me this 23d day of October 1911. My commission expires May 8, 1915.

[SEAL.]

GLADYS WALTON,
Notary Public.

DEFENDANTS' EXHIBIT ENVELOPE FOR LETTER ADDRESSED TO JOE SOLOMAN.

St. Louis, Mo.
Oct. 20,
4-P. M. 1911.

(Two Cent postage stamp.)

Mr. JOE SOLOMAN,
Fireball Gas Tank Co.,
Delmar and Kingshighway,
City.

DEFENDANTS' EXHIBIT LETTER TO JOE SOLOMAN.

"ST. LOUIS, Oct. 20/11.

DEAR JOE: I know your brother is heavily interested in the Fireball gas tank Co., and I want to tip you off that two men, who I understand are employed by the Prestolite Co. are putting some kind of fluid in the Fireball tanks I don't know what the object is but am sure it must be to hurt your light in some way.

Better be on the lookout I don't want to be mixed up in this but feel that your brother should know about it.

A FRIEND."

Motion to Strike Certain Affidavits on Behalf of Complainants from File.

Filed in the Circuit Court on Oct. 26, 1911.

Now come defendants in the above-entitled cause and move that the affidavits of Theodore du Moulin and Oramel H. Skinner be stricken from the file; and for grounds of this motion, defendants respectfully show:

That the said affidavit of said Theodore du Moulin is not entitled in this cause, and was sworn to before the filing of this suit; and

That the said affidavit of said Oramel H. Skinner is improperly entitled in this cause, because executed before the filing of this suit.

HUGH K. WAGNER,
Solicitor for Defendants.

283 Received a copy of the above this 26th day of October, 1911.

FORDYCE, HOLLIDAY & WHITE,
Solicitors for Complainants.

(*Order Overruling Motion to Strike Certain Affidavits for Complainants.*)

The Court having fully considered said defendant's motion to strike out the affidavits of Theodore du Moulin and Oramel H. Skinner filed on the part of the complainant, doth order that said motion be and the same is hereby overruled.

October 27th, 1911.

DAVID P. DYER, *Judge.*

(*Order granting Leave to File Exhibits and Affidavits and Deferring Hearing on Order to Show Cause.*)

Now come the defendants by their solicitors, and file sixty three exhibits in this cause, and now come the complainants by their solicitors and by leave of Court file affidavits in rebuttal to defendant's affidavits; thereupon on motion of said complainants it is ordered that the hearing on the order to show cause, be deferred until Thursday November 2nd 1911, or as soon thereafter as counsel may be heard.

October 27th 1911.

DAVID P. DYER, *Judge.*

Which said sixty three exhibits and four affidavits are respectively, in words and figures, as follows, to-wit:

DEFENDANTS' EXHIBITS.

CLERK'S NOTE.—Defendants' Exhibit No. 1, (Drawing of "Prest-O-Lite Tank"), and Defendants' Exhibit No. 2 (Drawing of Defendants' tank), are not inserted here, for the reason that same appears at pages 85 and 86 of this transcript.

(DEFENDANTS' EXHIBIT No. 3.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To All to Whom These Presents Shall Come, Greeting:

284 This is to Certify that the annexed is a true copy of Page 146 of a Bound Volume of the Library of this Office entitled:

Acetylene:

The Principles of Its Generation and Use,
by
Leeds and Butterfield,
London,
1903;

said Volume having been received in the Library August 19, 1904.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 25th day of January, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America, the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Assistant Commissioner of Patents.

Acetylene is readily soluble in many liquids. It is desirable on the one hand, as indicated in Chapter III., that the liquid in the seals of gas-holders, &c., should be one in which acetylene is soluble to the smallest degree practically attainable; while, on the other hand, liquids in which acetylene is soluble in a very high degree are valuable agents for its storage in the liquid state. Hence it is important to know the extent of the solubility of acetylene in a number of liquids. The following tabular statement gives the most trustworth- information in regard to the solubilities under the normal atmospheric pressure of 760 mm. or thereabouts:

Solvent.	Temperature.	Volumes of acetylene dissolved by 100 vols. of solvent.	Authority.
	Degs. C.		
Acetone	15	2500	Claude and Hess
"	50	1250	"
Acetic acid; alcohol	18	600	Berthelot
Benzoline; chloroform	18	400	"
Paraffin oil	0	103.3	E. Müller
"	18	150	Berthelot
Olive Oil	....	48	Fuchs and Schiff
Carbon bisulphide	18	100	Berthelot
Water (at 4.65 atmospheres pressures)	0	160	Villard
" (760 mm. pressure)	12	106.6	E. Müller
" "	15	110	Lewes
" "	18	100	Berthelot
" "	....	100	E. Davy (in 1836)
" "	19.5	97.5	E. Müller
Milk of lime: about 10 grammes of calcium hydroxide per 100 cc	5	112	(Hammerschmidt and Sandmann)
" " " "	10	95	"
" " " "	20	75	"

" " " "	50	38	"
" " " "	70	20	"
" " " "	90	6	"
Solution of common salt, 5%	19	67.9	"
(Sodium chloride) "	25	47.7	"
" 20%	19	29.6	"
" "	25	12.6	"
" (nearly saturated, 26%)	15	20.6	"
" (saturated, sp. gr. 1.21)	0	22.0	E. Müller
" " "	12	21.0	"
" " "	18	20.4	"
Solution of calcium chloride (saturated)	15	6.0	(Hammerschmidt and Sandmann)

Filed in the Circuit Court on Oct. 27, 1911.

287 (DEFENDANTS' EXHIBIT No. 4.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To All to Whom These Presents Shall Come, Greeting:

This is to Certify, that the annexed is a true copy of the last thirteen lines of Page 425 of a bound Volume of the Library of this office entitled:

Annales
De
Chimie et de Physique,
Quartieme Séire.—Tome IX.
Paris.
1866;

said Volume having been received in the Library March 2, 1867. Attached hereto, is a copy of a Translation made by the Official Translator in the matter of the same.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 25th day of January, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and Thirty-Fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

8. Solubilité de l'acétylène.—Voici quelques données recueillies incidement dans mes recherches et relatives à la solubilité de ce gaz dans divers menstrues, vers 18 degrés.

L'eau, le sulfure de carbone et l'hydrure d'amylène dissolvent environ leur volume d'acétylène;

Le pétrole d'éclairage, 1½ volume;

L'essence de térébenthine et le perchlorure de carbone, 2 volumes;

L'alcool amylique et le styrolène, 3½ volumes;

Le chloroforme et la bensine, 4 volumes;

L'acide acétique cristallisable et l'alcool absolu, près de 6 volumes.

Translation.

From "Annales de Chimie et de Physique," Fourth Series, Vol. IX 1866.

Last Thirteen Lines on Page 425, Being Part of an Article Entitled "Sur Quelques Réactions de l'Acétylène et de l'Allylène, by B. Barthelot.

288 8. Solubility of acetylene.—Below are some data which I collected incidentally in my experiments relative to the solubility of this gas in different solvents, at about 18°.

Water, carbon disulphide and amylene hydrate dissolve about their volume of acetylene.
Illuminating petroleum, 1½ its volume.
Essence of turpentine and carbon perchloride, 2 volumes.
Amylic alcohol and styrolin, 3½ volumes.
Chloroform and benzine, 4 volumes.
Crystallizable acetic acid and absolute alcohol, nearly 6 volumes.

N. E. K. 1-18-11.

Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 5.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This Is To Certify that the annexed is a true copy of an Article entitled "The Carbides and Acetylene Commercially Considered," by T. L. Willson and J. J. Suckert, Ph. D.; said Article beginning on Page 321, Issue of May 1895, of Publication in the Library of this Office entitled:

The Journal
of the
Franklin Institue,
Vol. CXXXIX.—Nos. 829-834.
January—June, 1895.
Philadelphia:
1895.

Said copy including Drawings in the matter of the same.
Said issue received in the Library May 10, 1895.
In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 28th day of February, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

E. B. MOORE,
Commissioner of Patents.

289 The Carbides and Acetylene Commercially Considered.

By T. L. Willson and J. J. Suckert, Ph. D.

Dr. SUCKERT: Members of the Franklin Institute, Ladies and Gentlemen: Before entering upon the subject matter of this paper namely, the commercial consideration of the carbides and acetylene, we believe that a brief history of these compounds, their method of

a violent reaction ensues. Acetylene is generated with considerable increase in temperature. If, however, large pieces are plunged into common sulphuric acid, the reaction is feeble.

An exhaustive series of experiments, made by Dr. H. Schweitzer, of New York, have shown that when treated at a red heat with dry muriatic acid gas, the carbide is decomposed with the formation of free carbon and small quantities of a yellow substance easily soluble in ether. When treated with steam at different temperatures, (up to 428° F.), and different pressures (up to 35 atm.), the material decomposed with the formation of but small quantities of the same yellow substance, and not in sufficient quantity for further examination.

Benzol, nitro-benzol, phenol, aniline, toluidine, and other organic compounds, gave no reaction when treated with carbide of calcium alone, and in the presence of water, at varying pressures and
292 temperatures. It would appear from the foregoing to be a very inert body in its action on other compounds, and in view of this fact, the ease with which it decomposes water at ordinary temperature is remarkable.

When treated with water in a closed vessel properly cooled, acetylene gas continues to be evolved from the material at pressures exceeding 75 atm. Calcium Carbide has the chemical formula CaC_2, and contains in 100 parts 62.5 parts of calcium and 37.5 parts of carbon.

The gaseous product of the decomposition of the alkali and alkaline earth metal carbides with water, namely, acetylene, is an unsaturated hydrocarbon of the series $CnH^2n—^2$, having the chemical formule C_2H_2, and containing, therefore, in 100 parts, 92.3 parts of carbon and 7.7 parts of hydrogen.

It was first recognized, and its chemical constitution determined, by Berthelot, in 1849. It has heretofore been formed in small quantities by passing ethylene, or the vapors of alcohol, wood alcohol, ether, and other organic compounds, through a red-hot tube. It is present in coal gas to the extent of 0.06 per cent and water gas contains almost 1.0 per cent. It has also been formed by passing hydrogen gas between carbon points brought to incandescence by the electric currect, which is the first recorded synthesis of an organic compound directly from its elements. It can also be produced by the incomplete combustion of the vapors of ether, anylene, etc.; or of illuminating gas, in the interior of a Bunsen burner; by passing the vapor of chloroform over red-hot copper; or from chloroform and potassium amalgam; or from chloroform and sodium; or by the electrolysis of fumaric and malic acids; by passing the vapor of ethylene chloride over red-hot soda lime; and finally, by allowing ethylene bromide to drop in a boiling concentrated solution of alcoholic potash, passing the impure acetylene into an ammoniacal cuprous chloride solution, washing the red precipitate with water, and, whilst still moist, boiling it with concentrated hydrochloric acid.

Acetylene is a colorless gas, having a penetrating pungent odor somewhat resembling garlic, which is of great importance in its ap-

plication to household illumination, as it renders the slightest escape of gas in a room easily detectable. It has a specific gravity of 0.91, and burns with a luminous sooty flame. It is soluble in water in about the same proportions as carbon dioxide, that is, at 64 F. water will absorb its own volume of the gas. Absolute alcohol and glacial acetic acid dissolve about six times their volume. It is practically insoluble in saturated brine, 100 volumes absorbing but five volumes of the gas, whereas paraffine will absorb two and one-half times its volume. By heating acetylene to the softening point of glass,
293 benzol (C_6H_6), styrolene (C_8H_8), naphthalene ($C_{10}H_8$), anthracene ($C_{14}H_{10}$), and retene ($C_{18}H_{18}$), are formed.

With an alkaline solution of permanganate of potash, acetylene is oxidized to oxalic acid, and with a dilute solution of chromic acid to acetic acid. By treating acetylene-copper with zinc and ammonia, ethylene is formed, and a mixture of acetylene and hydrogen, brought in contact with platinum black, forms ethane. By the electric spark, acetylene is resolved into carbon and hydrogen, at the same time a fluid and a solid poly-acetylene are formed; the latter resembles horn, and is insoluble in the ordinary solvents. A mixture of nitrogen and acetylene is converted by the induction spark into hydrocyanic acid.

It may be heated to a temperature of 370° F., and under a pressure of 43 atmospheres, without decomposition.

The gas can readily be condensed to a liquid, as is evidenced by the following table, the pressures being considerably less than those required for carbon dioxide.

Acetylene.		Carbon Dioxide.	
Fahr.	Atmospheres.	Fahr.	Atmospheres.
—116°	1.0	—112°	1.0
— 28.6°	9.0	— 29.2°	12.7
— 9.4°	11.01	4°	19.93
+ 14°	17.06	14°	26.76
32°	21.53	32°	35.40
41.45°	25.48	41°	40.47
56.3°	32.77	59°	52.17
67.27°	39.76	68°	58.84

The critical point of the gas has been placed by Ansdell at 98.69° F. He also determined the specific gravity of the liquefied gas at various temperatures, placing the density at about one-half that of carbon dioxide; but his results do not agree with those obtained by us in the production and storage of large quantities of the liquefied gas. For instance, the small tank to which this connecting pipe and burner are attached (Fig. 2) should contain, according to Ansdell, when filled at 69.08° F., about 2.15 pounds of liquefied acetylene; as a matter of fact, however, we can fill into this tank somewhat at

formation and their chemical and physical properties, will be of interest to you. That carbon will combine directly with various metals under the influence of heat, has long been known to chemists, but these compounds, generally known as "Carbides," have been but imperfectly studied, and, with the exception, perhaps, of the carbides of iron, are hardly known.

The only group of carbides which interests us this evening is that of the carbides of the alkali and alkaline-earth metals, such as the

Vol. CXXXIX. No. 833.)

potassium, sodium, barium, strontium and calcium carbides; for the reason that these are the only carbides which, when brought into contact with water, will decompose it, forming generally the hydrated oxide of the metal and acetylene gas. Of these latter carbides, the combination of calcium with carbon has the greatest commercial possibilities on account of the low first cost of the raw materials which enter into this combination, namely, lime and coal, the abundant deposits of same in all quarters of the globe, and the commercial value represented by the by-product, hydrate of lime, which is obtained in large quantities by the decomposition of the calcium carbide with water.

The history of the discovery and methods of production of this group of carbides may briefly be stated, as follows:

The first authentic reference to this subject was the discovery by Sir Humphrey Davy, that carbon and potassium, when heated to a temperature sufficiently high to vaporize the potassium, formed a compound which, after cooling, would effervesce with water.

Berselius, in 1836, determined that the black substance formed in small quantities as a by-product in producing potassium *form* potassic carbonate and carbon, was carbide of potassium.

Woehler, in 1862, prepared calcium carbide by fusing an alloy of zinc and calcium with carbon, and ascertained that it decomposed by contact with water forming calcic hydrate and acetylene.

Berthelot, in 1866, described sodium carbide or acetylene sodium. He produced it by the following method: Metallic sodium,
290 when slightly heated in acetylene gas, puffs up and absorbs acetylene with the formation of the compound C_2HNa. At a dull red heat sodium destroys acetylene, forming a black carbonaceous mass, C_2Na_2. The reaction is expressed by the following formula: $(C_2H_2+Na_2=C_2Na_2+H_2)$. This compound, C_2Na_2, in contact with water, regenerates acetylene.

From 1866 until 1888, a period of twenty-two years, nothing further has been recorded of scientific work done in this direction; as a matter of fact, the compounds so produced were not only very impure, but their cost of production also was so great as to render their commercial use prohibitory; they were considered as curiosities and looked upon by scientists as such. In 1888, Mr. T. L. Willson began a series of experiments relating especially to the reduction of refractory metallic oxides by carbon, in an electrical furnace. By this method the reductions were to be accomplished by the heat effect of the current alone, and not by electrolytic action.

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The results of these experiments, which were numerous and which extended over a period of years, developed some very interesting data as to the action of intense heat on refractory bodies generally, and especially as to the formation of carbides in large quantities. Mr. Willson found that lime, baryta, strontia and even alumina, when subjected to the intense heat of his electric furnace, were liquefied and formed a molten mass, which could be brought to ebullition. An addition of carbon thereto caused a decomposition of the oxide, carbon monoxide being formed, while the fused metal united instantly with the excess of carbon, previously introduced, to form a carbide. Further experiments developed the fact that when a mixture of powdered lime and coke dust was introduced into the furnace, the mixture would melt down to a thick syrupy mass of practically pure carbide of calcium, and that this, when removed from the furnace and brought in contact with water, envolved acetylene gas in large quantities. The carbides of barium, strontium and aluminum also were prepared in the same manner, and the specimens now before you are the results of these earlier experiments.

We will now introduce a small quantity of each of these carbides into different vessels containing water at ordinary temperature. The carbides of barium, strontium and calcium decompose water readily, forming the respective hydrates of their metallic oxides and acetylene gas, which we now ignite as it is being evolved in each vessel; the resulting gas, as you observe, burns with a luminous sooty flame (see Fig. 1). As the carbide of aluminum does not react with
291 water at ordinary temperatures, no gas is evolved from the fourth vessel.

This substantially completes the history of the alkali and alkaline-earth metal carbides up to the date of Mr. Willson's discovery.

The physical and chemical properties of pure calcium carbide, as first prepared in the Willson furnace, and which we now hand you for inspection, is a dark-brown, dense substance, having a crystalline metallic fracture of blue or brown appearance, and a specific gravity of 2.262; it evolves a peculiar odor when exposed to the atmosphere, due to the action of atmospheric moisture. In a dry atmosphere it is odorless. When exposed to the air in lumps, it becomes coated with a layer of hydrate of lime, which, to a great extent, protects the rest of the substance from further deterioration by atmospheric moisture. It is not inflammable, and can be exposed to the temperature of the ordinary blast furnace without melting. When exposed to the flame of a Bunsen blast-lamp it can be heated to a white heat, the exterior only being converted into lime. When brought into contact with water, or its vapor, at ordinary temperatures, it is rapidly decomposed, one pound generating, when pure, 5,892 cubic feet of acetylene gas at a temperature of 64° F. It also decomposes with snow at a temperature of —24° F. It is not acted upon by the vapor of water at high temperatures. It abstracts moisture readily from alcohol, also from liquefied ammonia gas, rendering the latter anhydrous. If small pieces are treated with common sulphuric acid,

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more than two and three-quarters pounds of the liquefied gas. We are now engaged in preparing a new table of pressure and specific gravities of the liquefied gas, and will be pleased to communicate the results to you at a later date. One pound of the liquid, when evaporated at 64° F., will produce fourteen and one-half cubic feet of gas at atmospheric pressure; or a volume 400 times larger than that of the liquid.

294 The odor of the gas has already been made apparent to you whilst the experiments showing the decomposition of the various carbides with water was being carried on. We will now show you the liquefied gas contained in this glass tube surrounded by a metal casing (Fig. 3). As you will observe, the liquefied gas forms a colorless, mobile, highly refractive liquid, which, when the pressure is slightly relieved, commences to boil and evolves a gas which, ignited as it issues from this gas tip, burns with an intensely white flame. If the liquefied gas be suddenly relieved of its pressure, or allowed to escape in its liquefied state to the atmosphere, a portion evaporates rapidly, thereby abstracting from the remaining portion sufficient heat to solidify it. This tank, which is now shown you (Fig. 4), contains liquefied acetylene, which has been cooled to a temperature of —28° F., in order to prevent the escape of too large a volume of gas during the process of its solidification. Attached to this valve, inside of the tank, is a tube which reaches within half an inch of the tank bottom, and is open at its lower end. We now attach to the valve a flannel bag to receive the solidified gas. Upon opening the valve the liquefied gas escapes, the solidified portion remaining in the bag while the gas formed escapes through the pores of the bag. This bag will hold about three-quarters of a pound of

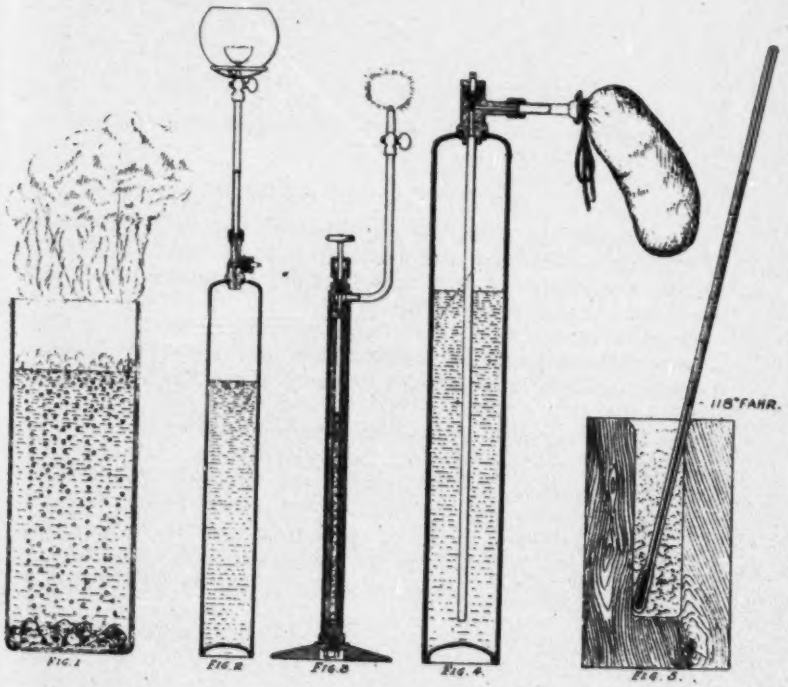
FIG. 6.

the solidified gas, and this is about the quantity which is now being emptied on the plate. A portion of this solidified gas will now be passed to you for inspection; another portion is packed into this wooden tube, a thermometer is inserted (Fig. 5), and, as you will observe, the temperature falls to —118 F. Another portion is placed on one pound of mercury contained in this saucer (Fig. 6); the intense cold of the solidified gas almost immediately solidifies the liquid metal. A portion of the solidified gas or "acetylene snow" is now dropped into this vessel (Fig. 7) containing water. Being lighter than water, it floats upon its surface, and when touched with a light the gas surrounding each particle of the solidified gas burns

with a sooty flame, and continues to burn until all the solidi-
295 fied gas has disappeared. I will now ignite the gas evolving from the acetylene snow contained in this dish, and you have the interesting exhibit of a solidified gas at —118° F., giving off gas which can be ignited, and which, although evolved at this low temperature, possesses the same illuminating power as at higher temperatures.

You have now seen acetylene in its three physical conditions, namely, as a gas, a liquid and a solid; and the mere fact that it readily assumes the gaseous and liquid condition is of vital importance to its commercial application.

319



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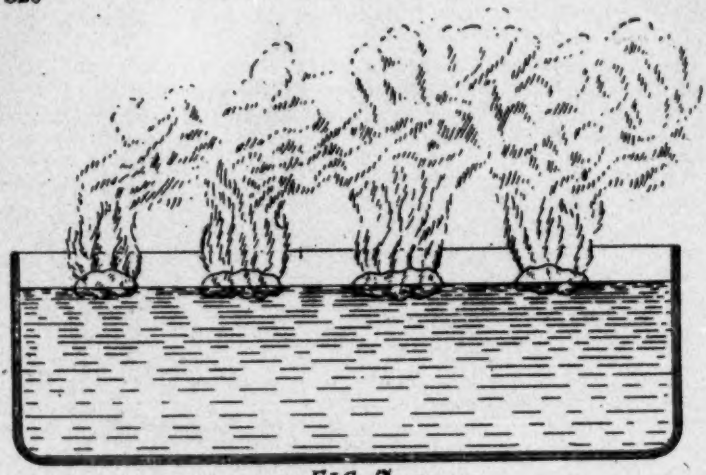

FIG. 7.

321 **Commercial Application.**

Having described the physical and chemical properties of calcium carbide and the product of its decomposition with water—acetylene—we will now consider the commercial possibilities of these compounds.

Carbide of calcium, as we have already shown, is a rich source of acetylene, but beyond this we cannot at present definitely designate additional commercial applications of this material.

Extended experiments are now being conducted to determine its commercial value in the production of cyanides and various nitrogenous compounds, in the manufacture of iron, steel and other metals, and their alloys, and in its application to the synthetical formation of various organic compounds. The results thus far obtained, however, although encouraging, do not as yet justify us in accepting them as commercially applicable.

As the commercial value of any material largely depends upon its cost of production, its purity, and the value of the products and by-products obtained therefrom, our first consideration will be the method of manufacturing the carbide of calcium and the cost of the finished product.

297

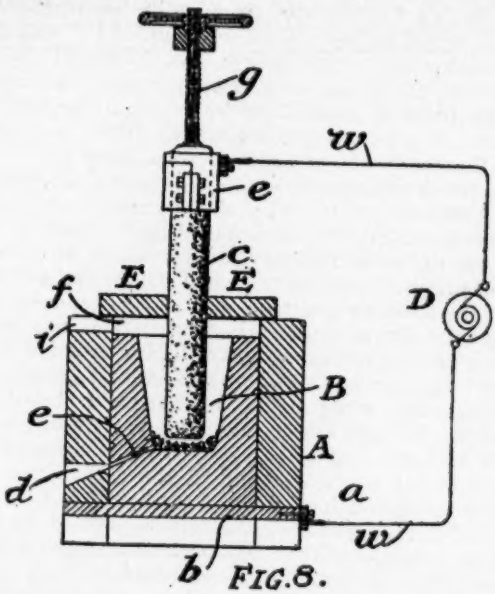

FIG. 8.

The carbide of calcium originally prepared by Mr. Willson during his first experiments was produced at a cost largely in excess of that for which it can be manufactured to-day, but a description of these original experiments will without doubt, be of interest to you.

The first experiments were made with the dynamo generating a current of 150 amperes at from 60 to 70 volts. The furnace consisted of a plate of carbon 12 inches square and 1 inch in thickness, along one edge of which an iron rod was bolted and projected beyond the mason work, and to which one terminal from the dynamo was connected. This carbon plate was embedded in brickwork, having only a small central portion exposed, upon which the graphite crucible rested. From one terminal of the dynamo, the current was conducted through the iron rod, carbon plate, graphite crucible, the material to be acted upon, and the carbon pencil, to the other terminal. To start the furnace, the pencil was placed in contact with the bottom of the crucible and the dynamo was started up slowly. As the electromotive force increased, the pencil was withdrawn from the bottom of the crucible and the "arc" established.

The material to be acted upon was then introduced through an opening in the cover of the crucible, the cover being either
298 of non-conducting material, or, if of graphite, insulated from the crucible by a non-conducting luting. One of the pencils from the original lot used in these earlier experiments is now before you. This carbon pencil is 12 inches long, 1¼ inches in diameter, copper-plated and has a hole bored through its entire

length, the tube so formed being used for the introduction of gaseous agents. With this furnace various metallic compounds, intermingled with pulverized carbon and also surounded by gaseous reducing agents, were subjected to the intense heat developed by the electric arc. The success attending the operation of this first furnace, in the reduction of refractory metallic oxides, justified the continuation of the experiments upon a larger scale, and to this end the Willson Aluminum Company was organized and a plant erected at Spray, N. C. This plant was supplied with a dynamo, operated by water-power, and generating a current of 2,000 amperes at 35 volts. The furnace was constructed as here shown (Fig. 8), namely:

A designates the outer masonry shed or bench of the furnace; B, the carbon or graphite crucible or hearth; C, the carbon bar or pencil constituting the movable electrode, and D, the dynamo, for generating the current. From the terminal brushes of this dynamo, one wire, *w*, leads to and communicates with the crucible B, while the other wire, *w'*, leads to and communicates with the carbon pencil C. The connections are usually made in the manner shown, the wire *w* being connected through a fastening-bar *a*, to an iron plate *b*, underlying the crucible B, and the wire *w'* being connected to a metal socket *c*, embracing the upper end of the carbon pencil C. The bench A is generally made of firebrick, which is a non-conductor of electricity, and the furnace is covered with a plate or, preferably, two plates, EE, of carbon, having a central hole through which the carbon pencil C projects down into the crucible.

For tapping out the resulting product, a tap-hole *d* is formed which, in operation, is closed by a plug *e* of clay or other suitable refractory material. The carbon plates EE rest on the top of the firebrick walls A, which project above the top of the crucible, forming an intervening space *f* for the furnace, between B and E. For the vertical adjustment of the carbon pencil a screw-threaded shaft *g* is provided, which may be moved up and down by the engagement therewith of a suitably-mounted rotative nut *h*.

The first carbide of calcium produced in this furnace, in accordance with memoranda taken at the time by Mr. Willson, was manufactured as follows: A mixture of lime and tar was boiled in a caldron, in the proportion of 60 pounds of lime to 11 gallons of
299 coal-tar, and the heating was continued until the mixture was perfectly dry. It was then introduced into the furnace and subjected to the heat of the electric arc for a period of two hours, gradually feeding the mixture of lime and tar to the furnace as fusion took place. The product obtained consisted of a purplish-yellow mass, which, in contact with water, evolved acetylene gas. A sample of the calcium carbide produced upon this occasion is now before you, and represents the first calcium carbide produced in an electrical furnace.

The experiment was repeated with a mixture of 15 pounds of tar in fused lime and alumina, the time required for the operation being one and one-half hours.

The product obtained was a black, crystalline mass, consisting of

a double carbide of calcium and aluminum. A sample of this double carbide is also submitted for your inspection.

Another run, made with a mixture of 10 pounds of lime and 10 pounds of finely-divided carbon, operating one hour, resulted in the production of a dark, crystalline mass, showing at its fracture black and blue crystals. A small metallic ingot was found in this mass, and a similar ingot of this white metal is now before you.

A fourth test, made with 17½ pounds of lime and 17½ pounds of carbon, resulted in obtaining 11 pounds of almost pure calcium carbide.*

The tests described represent but a few of the numerous experiments conducted by Mr. Willson in his efforts to successfully and economically produce calcium carbide on a large scale. Recent results in the application of the alternating current to its manufacture prove conclusively that calcium carbide, of a remarkable purity, can be commercially produced. The product now being manufactured, in quantities exceeding one ton per diem, all readily evolve in
300 Contact with water 5¾ cubic feet of acetylene gas per pound of the carbide used, a result closely approaching to that which is theoretically possible, namely, 5 89/100 cubic feet per pound of carbide.

The theoretical proportions of lime and carbon required for the production of 100 pound- of calcium carbide are, 87½ pounds of lime and 56¼ pounds of carbon. Of the latter 37½ pounds combine directly with the metal calcium; and 18¾ pounds combine with the oxygen of the lime, and escape from the furnace as carbon monoxide, in accordance with the following formulæ:

$$\begin{aligned}
CaO + C_2 &= CaC_2 + CO \\
87\tfrac{1}{2} + 56\tfrac{1}{4} &= 100 + 43\tfrac{3}{4} \text{ (lbs.)} \\
CaC_2 &= Ca + C \\
100 &= 62\tfrac{1}{2} + 37\tfrac{1}{2} \text{ (lbs.)} \\
CO &= C + O \\
43\tfrac{3}{4} &= 18\tfrac{3}{4} + 25 \text{ (lbs.)}
\end{aligned}$$

A further element of cost in its manufacture is the production of heat in the furnace by means of the electric arc. Extended experi-

---

*A sample of the carbide obtained during this last test was sent by Mr. Willson to Lord Kelvin, of the Glasgow University, and, in return, the following reply was received:

"THE UNIVERSITY, GLASGOW, October 3, 1892.

"DEAR SIR: I have seen and tried the calcium carbide, only, however, so far as throwing it into water and setting fire to the gas which comes off. It seems to me a most interesting substance and I thank you very much for sending it to me.

Yours very truly,

"KELVIN.

"Thomas L. Willson, Esq."

ments in this direction have shown that one electrical horse-power will readily produce twenty pounds of calcium carbide each twenty-four hours, and the present indications justify the assumption that with automatically-fed furnaces, properly insulated to retain the heat, and by utilizing the waste heat to increase the temperature of the material acted upon, the production of calcium carbide can be increased on a large scale to thirty pounds per electrical horse-power each twenty-four hours.

By using limestone and coal dust, the latter being practically a waste product (not at present utilized), it is believed that calcium carbide can eventually be produced at a cost of less than $5 per ton. Where bituminous coal is employed, the value of the by-products obtained by its conversion into coke will largely reduce the cost of manufacture.

The hydrate of lime obtained from the decomposition of the carbide with water can be used again in the manufacture of the carbide, or it can be employed in the manufacture of ready-mixed mortar, which is already quite an industry in the city.

The following details of the cost of producing 150 tons of calcium carbide per diem, as a by-product in the manufacture of 100,000 fire, and pressed-brick per diem, will, no doubt, interest you.

The figures were compiled by a manufacturer who was desirous of commercially utilizing the close proximity of large deposits of coal, limestone and clay. They show an annual profit of $635,640,
301 with a selling price of $7 per ton for carbide.

January 19, 1895.

Product of 1,400 Tons of Coal, 450 Tons of Clay and 270 Tons of Limestone.

150	tons of calcium, at $7	$1,050.00
10	tons of sulphate of ammonia, at $70	700.00
40	tons of coal tar, at $7	280.00
910	tons of coke, at 90 cents	819.00
50,000	fire brick at works at $15	750.00
50,000	dry pressed front brick, at $15	750.00
		$4,349.00

5,445,000 Feet of Rich Illuminating Gas.

3,240,000 feet of this will produce 12,000 horse-power for 24 hours, allowing 1¼ pounds coal per horse-power, and 9 cubic feet of gas as the equivalent of 1 pound of coal. 1,485,000 cubic feet of gas will burn 270 tons of limestone, producing 150 tons of lime, allowing 1,100 pounds of coal per ton of lime, and 9 cubic feet of gas as the equivalent of 1 pound of coal. 720,00- cubic feet of gas will burn 100,000 bricks, allowing 800 pounds of coal per 1,000 bricks.

Expenses:

Mining 1,400 tons of coal, at 55 cents	$770.00
Mining 450 tons of clay, at 35 cents	157.50
Mining 270 tons of limestone, at 25 cents	67.50
Labor on 1,000 tons of coke, at 20 cents	200.00
Freight on 210 tons of limestone, at 50 cents	135.00
Labor in grinding 150 tons of lime, at 25 cents	37.50
Labor in making 100,000 brick, at $2 per M	200.00
Labor in smelting calcium carbide	150.00
	$1,717.50
Twenty-five per cent on $1,717.50 for general expenses	429.37
	$2,146.86
Interest on plant per day	83.33
	$2,230.20

Income	$4,349.00
Expenses	2,230.20
Net income per day	$2,118.80

Net income per year (300 days) $635,640.00

302 Arrangements are now being made by the Electric-Gas Company, of New York City, with the Niagara Falls Power Company, to apply 1,000 electrical horse-power to the manufacture of calcium carbide, which is shortly to be increased to 5,000 horse-power, and, eventually, we will, without a doubt, see the entire available power the company now possesses converted into electrical energy for the manufacture of this product. The effect of such a production would be far-reaching, and the economies resulting therefrom, if stated tonight, appear exaggerated and visionary. Assuming that but 20 pounds of the carbide are produced per indicated horse-power each 24 hours, then the amount manufactured during 300 working days would be 3 tons per horse-power per year; and, applying 100,000 horse-power to its production, the annual output of such an establishment would be 300,000 tons. From this amount of material 3,300,000,000 cubic feet of acetylene gas should be produced, and as its illuminating power, compared with ordinary illuminating gas of 25 candle-power, is as ten to one, it would represent fully 33,000,000,000 cubic feet of this gas—an amount which would probably equal the annual output of the entire gas industry of the United States.

As this is but one of the many applications of the product obtained by the decomposition of the carbide with water, the manufacture of the carbide itself must, of necessity, become a large industry.

As we have previously informed you, pure calcium carbide contains, in 100 parts, 37.5 parts of carbon and 62.5 parts of calcium, and when brought in contact with water, acetylene is generated to

the extent of 5.89 cubic feet of the gas to each pound of carbide used; or if compared by weight, 100 pounds of calcium carbide and 56.25 pounds of water evolve 40.63 pounds of acetylene gas, and form 115.62 pounds of calcic hydrate, in accordance with the following formula:

CaC_2	$2H_2O=CaOH_2O$	C_2H_2
100	56.25—115.62	40.625 (pounds)

The acetylene gas so generated contains, in 100 parts, 92.3 parts of carbon and 7.7 parts of hydrogen, or in the 40.625 pounds generated from 100 pounds of carbide, we have 37½ pounds of carbon and 3⅛ pounds of hydrogen. The entire carbon contained in the calcium carbide has, therefore, combined with the hydrogen of the decomposed water to form a new compound of a gaseous nature and extremely rich in carbon.

In its commercial application acetylene can be produced either directly from the calcium carbide by decomposition with water, or it may be evolved from the liquefied gas contained in suitable receivers.

303 When manufactured directly from the carbide, two methods can be employed; in one, small quantities of water are allowed to flow upon the carbide and the resulting gas is conducted to an ordinary gasometer, from which it can be drawn for use; this method is more or less intermittent. The other method dispenses with a gasometer and permits the continuous generation of either large or small quantities of the gas, and this is accomplished by partially submerging in water a vessel, open at the bottom and containing carbide suspended on a screen in the upper part of the vessel, the generated gas being withdrawn from above the carbide. As long as gas is being used the water remains more or less in contact with the carbide; as soon, however, as the withdrawal of gas diminishes or entirely ceases, the pressure of the generated gas forces the water from the carbide into the lower chamber of the vessel, thereby preventing a further generation of the gas. The apparatus is automatic, and extremely regular in its operation.

In the employment of either of the above methods, the only by-product obtained is slaked lime, the amount of gas produced being the same, namely, 5½ feet for each pound of calcium carbide used.

The liquefied gas is manufactured commercially by decomposing the carbide of calcium with water in a closed vessel, and conducting the gas generated under pressure to a condenser, where it liquefies and is then drawn off in tanks ready for distribution.* The liquefied gas, exhibited this evening, has been produced in this manner.

Before entering upon the use of acetylene as an illuminant, we desire to call your attention to the fact that its rapid and extraordinary development in this direction is largely due to the individual

*A full description of this process and of the apparatus required therefor, is contained in U. S. Patent, No. 535,944, March 19, 1895.

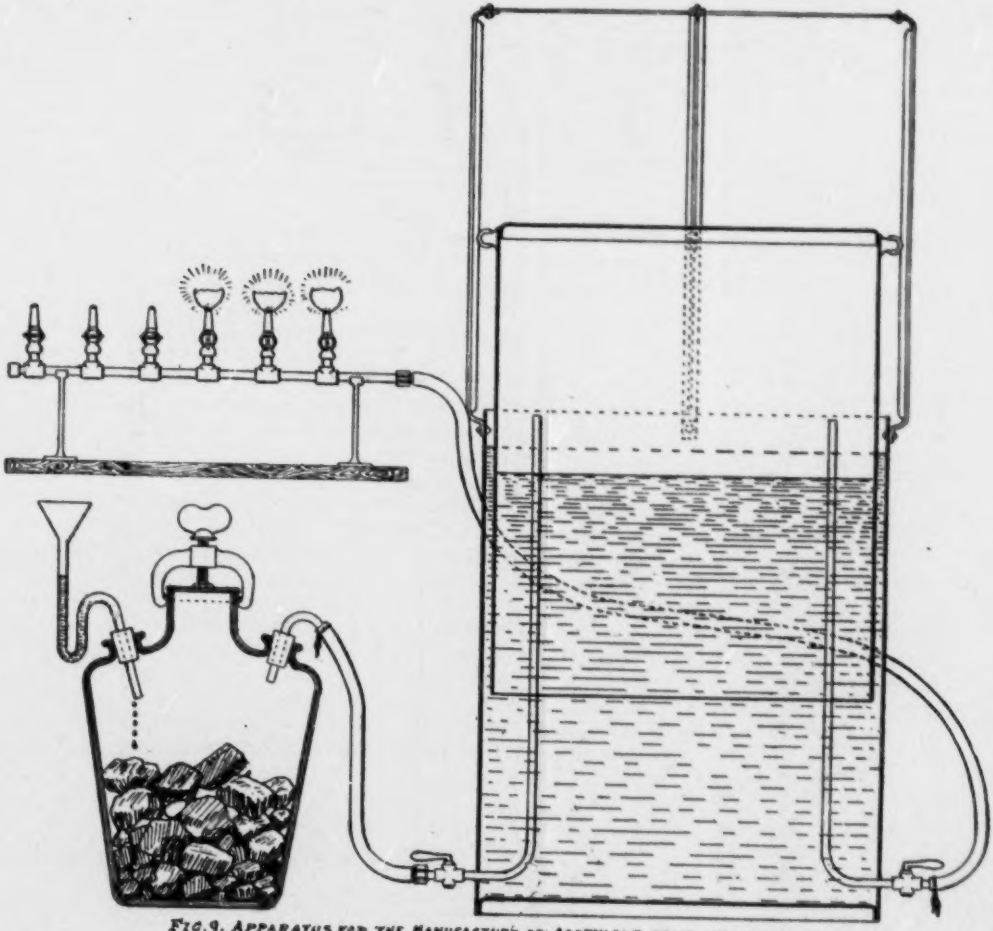

FIG. 9. APPARATUS FOR THE MANUFACTURE OF ACETYLENE FROM CALCIUM CARBIDE

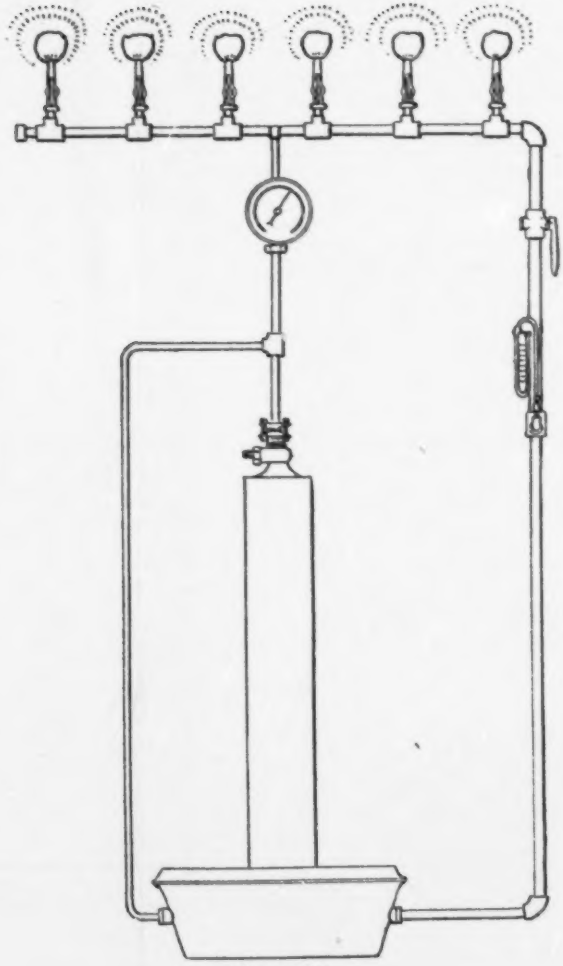

FIG. 10.

efforts of Mr. E. N. Dickerson, of New York City, who, endowed with a special knowledge of the subject, has labored unceasingly to bring about the successful result which you will see this evening.

As an illuminant, acetylene surpasses in lighting power and economy all other illuminants known; when burned at the rate of five cubic feet per hour, it produces a light equal to 250 candles, whereas the best illuminating gas made from coal, or water gas, rarely exceeds twenty-two candles for each five cubic feet burned per hour. Your Philadelphia city gas is rated at from nineteen to twenty candles. Acetylene gas will, therefore, produce twelve and one-half times more light if the same quantity be consumed, or, 1,000
304 cubic feet of acetylene gas will give you the equivalent in lighting power of 12,500 cubic feet of your city gas; it has, therefore, twelve and one-half times the value. To illustrate more fully the difference, we will first pass your city gas to the tube attached to this stand, and ignite the gas as it issues from the burners; we then conduct acetylene gas to a similar row of burners, and light these; the contrast, as you will perceive, is almost marvelous.

The acetylene consumed in these burners has been generated, in the apparatus before you, in the following manner: Upon the carbide contained in this closed jar (Fig. 9), water is poured in small quantities through the glass funnel communicating with the interior of the jar. The acetylene gas generated passes through this tube to the inside of the gasometer, thereby lifting the holder to the position which it now occupies, and the gas can then be conducted from the holder to the burners by means of this rubber tube. As the gas is being consumed and the holder lowers, the supply is rapidly renewed by pouring an additional amount of water through the funnel upon the carbide contained in the closed jar. We will also light the gas produced from liquefied acetylene contained in this small tank (Fig. 10), and, as you observe, it burns with the same brilliancy and lighting power as the gas produced directly from the carbide.

The liquefied gas contained in the small tank weighs just two pounds, and is capable of generating twenty-nine cubic feet of acetylene gas, which is at the rate of fourteen and one-half cubic feet per pound. The gas produced by the vaporization of the liquid at a

(Here follow drawings marked pages 305 and 306.)

pressure, as the gauge now indicates, of forty atmospheres, passes from the tank to a reducing valve upon which the tank stands, whereby its pressure is reduced to that of a two-inch water column, as indicated on this U water gauge, and it is under this pressure that we are supplying the gas to the burners attached to the arm above. Each of the burners supplied with acetylene gas will consume, at the pressure indicated, 1 2/10 cubic feet per hour, each, therefore, emits

a light equal to sixty candle-power; the total candle-power of
307 the six burners in use is, therefore, 360, and the amount of gas consumed each hour 7 2/10 cubic feet. To obtain this result with city gas would require the consumption of at least ninety cubic feet per hour.

The amount of oxygen withdrawn from the atnosphere of this room by the acetylene for the same amount of light is but one-sixth of that required for your city gas; the products of combustion are, therefore, reduced in proportion and the air of the room is not vitiated to the same extent.

From the appearance of the acetylene flame it would seem as though its temperature was exceedingly high; but recent determinations have shown that the temperature of the flame does not exceed 900° C., whereas the temperature of ordinary illuminating gas exceeds 1,400 C. For an equal amount of light the heat developed by the combustion of acetylene gas but slightly exceeds that of the incandescent electric lamp.

We have before us to-night, therefor-, an ideal illuminating gas; its presence in a room can readily be detected by its penetrating odor; it emits more light with less heat than any other illuminating compound; it consumes less oxygen, and it can be commercially produced at less cost, for an equal amount of light. Furthermore, it is capable of being stored either as a solid, in the form of carbide, or as a gas, or as a liquid; and these qualities alone are of exceptional value in its commercial application.

As a solid, in the form of carbide, waste water-power throughout the world can be utilized for its manufacture, and it can be shipped long distances without material deterioration. As a gas, it can be generated from carbide and applied as such; and in the form of a liquid, it can be applied to all purposes of isolated lighting, such as railroad and street cars, carriages, bicycles, steamships, sailing vessels, street lighting (by placing a small tank in each lamp-post (see Fig. 2) house lighting (in both city and country), buoys, lighthouses, lanterns, and to the enriching of ordinary illuminating gas in dwellings. Its application to this latter purpose will permit the gas companies to produce a low-priced gas for heating purposes, which can then readily be enriched in each house with acetylene gas generated from a tank of the liquified gas. To show the value of acetylene gas if applied to the lighting of your city, we will make a comparison, which may surprise you. The amount of gas produced by your city works will approximate 4,000,000,000 cubic feet per year, of, say, twenty candle-power. By the use of acetylene gas, the amount of gas required would be reduced in the proportion of
1 to 12.5; or, 4,000,000,000 cubic feet of city gas could be
308 replaced by 320,000,000 cubic feet acetylene gas, representing a saving of 3,680,000,000 cubic feet of gas annually.

In addition to its value as an illuminant, acetylene gas can be used commercially for power and heating purposes; and in the form of a liquefied gas it will be invaluable for such use. Its application in this direction is, however, such an extensive one that we are compelled to make it the subject matter of another paper. In conclusion, we desire to thank you all for your kind attention, and especially

UNITED STATES PATENT OFFICE.

EDWARD N. DICKERSON, OF NEW YORK, N. Y.

PROCESS OF STORING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 662,258, dated November 20, 1900.

Application filed April 2, 1897. Serial No. 631,310. (No specimens.)

To all whom it may concern:

Be it known that I, EDWARD N. DICKERSON, of No. 253 Broadway, in the city, county, and State of New York, have invented a new and useful Improvement in Processes of Preventing Explosions and Storing Acetylene Gas under Pressure, of which the following is a full, true, and exact description.

It is well known that liquefied acetylene gas has at normal temperatures a pressure in excess of six hundred pounds to the square inch. It is also known that highly-compressed acetylene gas under some circumstances can be suddenly decomposed. Acetylene gas is when liquefied in the most condensed form now known, but the pressure is considerable, and for some purposes it would be important to diminish this pressure, at the same time avoiding any risks of a violent decomposition being carried through the mass.

I have discovered that liquefied acetylene gas can be mingled with other liquids—as, for instance, fusel-oil—in such proportions that it becomes practically part of the fusel-oil and is absorbed by or combined with it. This operation likewise reduces the pressure of the liquefied acetylene to a great extent, dependent upon the proportion of liquefied acetylene which may be mingled with or absorbed by the liquid absorbent.

By my process I propose, in the first place, to liquefy acetylene gas according to the process now well known. It can then be transported, if desired, to the place of use. If then it is mingled with a liquid, such as fusel-oil, in suitable proportions, the pressure of the acetylene will be greatly diminished, and the acetylene, being mingled with the fusel-oil, will prevent an explosion passing through this mingled mass. Several times the volume of gaseous acetylene can thus be mingled with the absorbent and disappear therein, and this gas will be given off as the pressure is again reduced.

I do not claim to be the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusel-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent.

The amount of acetylene to be added to the solvent will be readily determined by the fact that if no more is added than the solvent will dissolve the pressure will be reduced several hundred pounds below that of the liquefied gas. Of course if too much liquefied gas is added the pressure will increase to that of the normal pressure of such liquefied gas.

In practice I provide a cylinder containing a known amount of the solvent. To this I connect the cylinder containing liquefied gas through an intermediate chamber having proper capacity and having stop-cocks above and below. The connection being made, I allow the liquefied gas to pass into the intermediate chamber by opening the upper stop-cock. Then closing this and opening the lower stop-cock the liquefied gas passes into the body with which it is miscible. Then closing the lower stop-cock and the stop-cock upon the receiving-chamber the operation is completed.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process of preventing explosions and reducing the pressure of acetylene gas, which consists in mingling liquefied acetylene gas in suitable, miscible proportions with a solvent, such as fusel-oil, and maintaining the same under a reduced pressure, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

E. N. DICKERSON.

Witnesses:
W. LAIRD GOLDSBOROUGH,
F. L. FREEMAN.

the officers and members of the Franklin Institute, for the interest they have manifested in our work.

Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANT'S EXHIBIT No. 6.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To All to Whom these Presents Shall Come, Greeting:

This is to Certify that the annexed is a true copy from the records of this Office of the Letters Patent of Edward N. Dickerson, Number 662,258 Granted November 20, 1900, for Improvement in Processes of Storing Acetylene Gas. Application filed April 8, 1897.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 14th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Commissioner of Patents.

THE UNITED STATES OF AMERICA:

To all to Whom these Presents shall come:

Whereas Edward N. Dickerson, of New York, N. Y. has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in
309 Processes of Storing Acetylene Gas, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and

Whereas upon due examination made the said claimant is adjudged to be justly entitled to a patent under the law;

Now therefore these Letters Patent are to grant unto the said Edward N. Dickerson, his heirs or assigns for the term of seventeen years from the twentieth day of November, one thousand nine hundred, the exclusive right to make, use, and vend the said invention throughout the United States and the territories thereof.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twentieth day of November, in the year of our Lord one thousand nine hundred, and of the Independence of the United States of America the one hundred and twenty-fifth.

[SEAL.] RHOS. RYAN,
First Assistant Secretary of the Interior.

Countersigned:
C. H. DUELL,
Commissioner of Patents.

(Here follows specification marked page 310.)

311 Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANT'S EXHIBIT No. 7.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents in the matter of the Letters Patent of Edward N. Dickerson, Number 662,258, Granted November 20, 1900, for Improvement in Process of Storing Acetylene Gas.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 16th day of December in the year of our Lord one thousand nine hundred and ten and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

(Serial Number) 631,319. Div. 31. (Ex'r's Book) 112/17.

1897.

Div. 31.

Patent No. 662,258.
Edward N. Dickerson, of New York.
County of ——,
State of New York.
Invention: Process of Preventing Explosions and Storing Acetylene Gas under Pressure.

Parts of application filed.
- Petition, April 3, 1897.
- Affidavit, April 3, 1897.
- Specification, April 8, 1897.
- Drawing No. —.
- Model No. —.
- Specimen No. —.
- First fee, cash, $15, April 3, 1897.
- First fee, cert., —.
- App. filed complete Apl. 8, '97.

312 Examined: Oct. 29", 1900. G. S. Ely, Ex.
Countersigned: J. W. Babson, For Commissioner.
Notice of allowance, October 30, 1900.
Final fee, cash, $20, Nov. 1, 1900.
2. Final cert., ——, 189–.
Patented November 20, 1900.

—— ——, 141 B'dway.

Asso-
3. Foster & Freeman, Washington, D. C.
Enclos.

NEW YORK, 2 April, 1897.

Amount Received, $15, C'ks. Chief Clerk.

Hon. Commissioner of Patents, Washington, D. C.

SIR: I send herewith application for Improvement in Process of Preventing Explosions and Storing Acetylene Gas under Pressure, together with my check for fifteen dollars to pay the preliminary fee thereon.

Respectfully,

E. N. DICKERSON,
Per COUTAUF.

Indorsed: U. S. Patent Office, Apr. 3, 1897. Chief Clerk.

To the Commissioner of Patents:

Your Petitioner Edward N. Dickerson, of No. 253 Broadway, in the City, County and State of New York, prays that letters Patent may be granted to himself for the improvement in Process of Preventing Explosions and Storing Acetylene Gas under Pressure, set forth in the annexed Specification,

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and he hereby appoints — of 253 Broadway, in the City of New York, attorney with full power of substitution and revocation, to prosecute this application, to make amendments and alterations therein, to sign the drawings, to receive the patent, and to transact all business in the Patent Office connected therewith.

[Matter enclosed between rules erased in copy.]

E. N. DICKERSON.

313 *Specification.*

To all whom it may concern:

Be it known, that I, Edward N. Dickerson, of No. 253 Broadway, in the City, County and State of New York, have invented a new and useful Improvement in Process of Preventing Explosions and Storing Acetylene Gas under Pressure, of which the following is a full, true and exact description.

It is well-known that liquefied acetylene gas has, at normal temperatures, a pressure in excess of six hundred pounds to the square inch. It is also known that highly compressed acetylene gas, under [some] circumstances, can be suddenly decomposed. Acetylene gas is, when liquefied, in the most condensed form now known; but the pressure is considerable, and for some purposes it would be important to diminish this pressure, at the same time avoiding any risks of a violent decomposition being carried through the mass.

I have discovered that liquefied acetylene gas can be mingled with other liquids, as, for instance, fusel oil, in such proportions that it

becomes practically part of the fusel oil and is absorbed by or combined with it. This operation likewise reduces the pressure of the liquefied acetylene to a great extent, dependent upon the proportion of liquefied acetylene which may be mingled with or absorbed by the liquid absorbent.

By my process I propose, in the first place, to liquefy acetylene gas according to the process now well-known. It can then be transported, if desired to the place of use. If then it is mingled with a liquid, such as fusel oil, in suitable proportions, the pressure of the acetylene will be greatly diminished, and, the acetylene being mingled with the fusel oil, will prevent an explosion passing through this mingled mass. Several times the volume of gaseous acetylene can thus be mingled with the absorbent and disappear therein, and this gas will be given off as the pressure is again reduced.

I do not claim to be the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquef*ica*tion of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusel oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent.

The amount of acetylene to be added to the solvent will be readily determined by the fact that if no more is added than the solvent will dissolve, the pressure will be reduced several hundred pounds below that of the liquefied gas. Of course, if too much liquefied gas is added, the pressure will increase to that of the normal pressure of such liquefied gas.

314 In practice I provide a cylinder containing a known amount of the solvent. To this I connect the cylinder containing liquefied gas through an intermediate chamber having proper capacity, and having stop-cocks above and below. The connection being made, I allow the liquefied gas to pass into the intermediate chamber by opening the upper stop-cock. Then closing this and opening the lower st*ock*-cock, the liquefied gas passes into the body with which it is miscible. Then closing the lower stop-cock and the stop-cock upon the receiving chamber, the operation is completed.

What I claim as my invention, and desire to secure by Letters Patent, is:

Substitute A, July 23, '98.

---

1. The process of preventing explosions in and reducing the pressure of $\overset{\text{liquefied}}{\wedge}$ acetylene gas, which consists in mingling a miscible proportion of such $\overset{\text{liquefied}}{\wedge}$ gas with a solvent, such as fusel oil, maintaining the same under a reduced pressure, and allowing its gradual escape from the absorbent fusel-oil in accordance with the consumption of the gas, substantially as desired.

June 18, '97.

2. The process of preventing explosions in and reducing the pressure of liquefied acetylene, which consists in liquefying the same in a suitable receptacle, disconnecting, the said receptacle from the com-

pression apparatus, transporting it to the place of consumption of the acetylene, and there mingling said gas with a suitable absorbent liquid under pressure, and maintaining said gas at said reduced pressure until the same is required for consumption, substantially as described.

[Matter enclosed between rules erased in copy.]

In Testimony Whereof, I have signed my name to this Specification in the presence of two subscribing witnesses.

E. N. DICKERSON.

Witnesses:
W. LAIRD GOLDSBOROUGH.
F. L. FREEMAN.

Oath.

STATE OF NEW YORK,
City of New York,
County of New York, ss:

Edward N. Dickerson, the above named petitioner, citizen of United States, and resident of New York City, County and State, being duly sworn, deposes and says that he verily believes
315 himself to be the original, first and sole inventor of the improvement in Process of Preventing Explosions and Storing Acetylene Gas under Pressure, described and claimed in the foregoing Specification; that the same has not been patented to him or to others with his knowledge or consent in any country; that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application, and he does not know and does not believe that the same was ever known or used prior to his invention thereof.

E. N. DICKERSON.

Sworn to and subscribed before me, this 2d day of April 1897.
[NOTARIAL SEAL.] W. LAIRD GOLDSBOROUGH,
Notary Public (*No.* 36), *New York Co.*

Indorsed: United States Patent Office, Apr. 8, 1897. U. S. Patent Office, Apr. 10. 1897. Division 31; U. S. Patent Office Apr. 3, 1897. Chief Clerk. Serial No. —, Paper No. ½. Application. Filed Apr. 8, 1897. Dickerson.

2–046.

This memorandum should under no circumstances be destroyed or otherwise permanently removed from the file.

Memorandum of the completion of the Application of E. N. Dickerson for Letters Patent on.....
Received incomplete.....

Petition: .....
Oath: .....
Specification: .....One Wit- .....
Applicant advised Ap'l 6/97.
Drawing: .....reg'd .....
Fee: .....
General: .....

The following are the numbers of the Chief Clerk's letters relating to this case:

(1)..... (4).....
(2)..... (5).....
(3)..... (6).....

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

316 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., May 10, 1897.
Mailed " " "

Edward N. Dickerson, 253 Broadway, New York City:

Please find below a communication from the Examiner in charge of your application, No. 631,319, Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Benj. Butterworth.

E. B. MOORE,
Commissioner of Patents.

The above case has been examined.

The claims in this case are rejected upon French patent 257,679, Claude and Hess, June 30, 1896, (Acetylene). Attention is also called to Wurtz Dictionaire De Chemie Pure et Appliquee, Tome 1 partie 1 page 43.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 631,319, Paper No. 1; Rejec.; Dated May 10, 1897.

Room 39.

Applicant, Edward N. Dickerson. Invention, Pro. of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial #631,319.

To the Hon. Commissioner of Patents.

SIR: We file herewith an associate power-of-attorney from E. N. Dickerson, in the above entitled application.

Respectfully, FOSTER & FREEMAN, *Attorneys.*

Washington, D. C., May 17, 1897.

253 BROADWAY, NEW YORK, May 14th, 1897.

In the Matter of the Application of Edward N. Dickerson for Improvement in Process of Preventing Explosions and Storing
317 Acetylene Gas under Pressure. Filed April 8th, 1897. Serial No. 631,319.

Room No. 39.

Hon. Commissioner of Patents.

SIR: I hereby appoint Charles E. Foster & Frank L. Freeman, composing the firm of Foster & Freeman, of Washington, D. C., my associate attorneys in the above-entitled application.

Respectfully, E. N. DICKERSON.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communication- respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., June 22, 1897.
Mailed " " "

Edward N. Dickerson, care of Foster and Freeman, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 631,319, Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Files April 8, 1897.

BENJ. BUTTERWORTH.
E. B. MOORE,
Commissioner of Patents.

Since the previous action in this case a description of the Claud and Hess method has been discovered and will be found in the Journal of Gas Lighting, etc., London, April 20, 1897, page 886 and in Comptes Rendus, De L. Acadamie des Sciences March 22, 1897, to which applicant's attention is called.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 631,319, Paper No. 3; Letter; Dated June 22, 1897.

Room 39.

Applicant, Edward N. Dickerson. Invention, Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

318 Hon. Commissioner of Patents.

SIR: We amend this case as follows:

Claim 1, line 2, before "acetylene" insert the word —liquefied—
Same claim, line 3, before the word "gas" insert the word —liquefied—

We call attention to the fact that claim 2, specifies liquefied acetylene.

Applicant's invention consists in the mixing not of gas broadly, but of gas in the condition of a liquid with another liquid. This is clearly pointed out in the specification and it is now clearly defined in the claims.

Applicant does not claim broadly merely forcing a gas into a liquid solvent, as that in itself is old, but so far as is known applicant is the first to mix a gas in the condition of a liquid with another liquid for the purposes set forth.

The patent to Claude & Hess does not describe this invention.

An allowance is requested,

Respectfully, FOSTER & FREEMAN,
Att'ys for Dickerson.

June 18th, 1897, Washington, D. C.

Indorsed: U. S. Patent Office, Jun- 18, 1897, Division 31; Serial No. 631,319, Paper No. 4; Amendment. Filed June 18, 1897. Dickerson.

Div. N, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Aug. 2, 1897.
Mailed " " "

Edward N. Dickerson, care of Foster and Freeman, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 631,319, Process of Preventing Ex-
319 plosions and Storing Acetylene Gas Under Pressure. Filed April 8, 1897. Benj. Butterworth.

E. B. MOORE,
Commissioner of Patents.

The above case has been reconsidered in view of amendment of June 18, 1897.

In reply to applicant's amendment — June 18, 1895, it is stated that the applicant has apparently not looked up the article in the Comptes Rendus referred to in the letter of June 22. Such article antedated applicant's dates and described the mixture of liquefied acetylene and acetone. The claims are again rejected.

ELY, *Ex.*

STOKES.

United States Patent Office.

Room No. 39.

In the Matter of the Application of Edward N. Dickerson for Improvement — Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

STATE OF NEW YORK,
City and County of New York, ss:

Edward N. Dickerson, being duly sworn, deposes and says: I conceived of the invention here in controversy as early as the year 1895. At that time the invention was reduced to practice by mingling liquefied acetylene with various solvents, among others, fusel oil, benzene and others. They were so mingled in glass tubes, and carefully studied with reference to increase in volume. The reduction to practice of the invention was at that time complete.

E. N. DICKERSON.

Subscribed and sworn to before me, this 21st day of January, 1898.

[NOTARIAL SEAL.] W. LAIRD GOLDSBOROUGH,
Notary Public, New York Co.

United States Patent Office.

Room No. 39.

In the Matter of the Application of Edward N. Dickerson for Improvement — Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Filed April 8, 1897. Serial No. 631,319.

320 STATE OF NEW YORK,
City and County of New York, ss:

Julius J. Suckert, being duly sworn, deposes and says: I am coinventor with Mr. Edward N. Dickerson in regard to several processes for the liquefication of acetylene. In the year 1895, at his suggestion, I caused mixtures to be made of liquefied acetylene gas with a number of solvents, among others, fusel oil, benzene, and others. These mixtures were carefully studied with reference to the increase in volume and other physical facts, at that time.

JULIUS J. SUCKERT.

Subscribed and sworn to before me, this 21st day of January, 1898.

[NOTARIAL SEAL.] W. LAIRD GOLDSBOROUGH,
Notary Public, New York Co.

Indorsed: U. S. Patent Office, Jan. 25, 1898; Division 31. Serial No. 631,319; Paper No. 6; Affidavits; Filed Jan. 25, 1898; Dickerson.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., March 12, 1898.
Mailed " " "

Edward N. Dickerson, care of Foster and Freeman, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 631,319, Process of Preventing Explosions

and Storing Acetylene Gas Under Pressure. Filed April 8, 1897. C. H. Duell.

E. B. MOORE,
Commissioner of Patents.

The above case has been reconsidered in view of affidavit filed Jan. 25, 1898.

The affidavits filed are held to be insufficient for the following reasons: First, covering simply laboratory experiments consisting simply in mingling liquefied acetylene with solvents in glass tubes
321 and not a reduction to practice. Second, not covering the process defined by the claims, viz: liquefying acetylene gas, and mingling the same in a miscible proportion with a solvent, such as fusel oil, maintaining the same under a reduced pressure and allowing its gradual escape from the absorbent in accordance with the consumption of the gas. Claim 2 should be amended by cancelling the words "disconnecting the said receptacle from the compression apparatus, transposing it to the place of consumption of the acetylene", as having no direct connection with the process.

The reference, viz; Claud and Hess. The Journal of the Franklin Institute and Wurtz, are still held to be an anticipation of the claims. In connection with the Journal and Wurtz, it is true specific reference — not made to liquefied acetylene. This seems immaterial.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 631,319, Paper No. 7. Rejec. Dated M'ch 12, 1898.

141

[253]* BROADWAY, NEW YORK, July 22, 1898.

In the Matter of the Application of E. N. Dickerson for Improvement in Process of Preventing Explosions and Storing Acetylene Gas under Pressure. Serial No. 631,319. Filed Ap'l 8th, 1897.

Room No. 39.

Hon. Commissioner of Patents.

SIR: Strike out the present claims, and insert:

A. The process of preventing explosions and reducing the pressure of acetylene gas, which consists in mingling liquefied acetylene gas in suitable, miscible proportions with a solvent, such as fusel oil, and maintaining the same under a reduced *pressure, substantially as described.*

A reconsideration is requested.

Respectfully, E. N. DICKERSON. (855.)

Indorsed: U. S. Patent Office, Jul- 25, 1898. Division —. United States Patent Office, Jul- 23, 1898. Serial No. 631,319, Paper No. 8. Amendment A. Filed July 23, 1898. Dickerson.

[Words and figures enclosed in brackets erased in copy.]

322 Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Aug. 16, 1898.
Mailed " " "

Edward N. Dickerson, care of Foster and Freeman, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 631,319, Process of Preventing Explosions and Storing Acetylene Gas Under Pressure. Filed April 8, 1897.

C. H DUELL.
E. B. MOORE,
Commissioner of Patents.

The above case has been reconsidered in view of amendment of July 23, 1898. The claim presented, which is substantially the same as heretofore considered, is a second time rejected upon the references of record and an appeal is in order.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 631,319, Paper No. 9. 2nd Rejec. Dated Aug. 16, 1898.

Serial No. 631,319, Paper No. 10.

No. 23,022 C.

Appeal.

Name, E. H. Dickerson.
Filed April 8, 1897.
Title, Process of Preventing Explosions and Storing Gas under Pressure.

To Examiners-in-Chief.

Reasons for appeal, Aug. 16, 1900.
Examiner's statement, Aug. 23, 1900.
Notice of hearing, Oct. 4, "
Brief,——
Decision, Examiner reversed.
Notice of decision, Oct. 18, 1900.

323 To Commissioner.

Received, ...
Brief, ...
Notice of hearing, ...
Decision, ...
Notice of decision, ...

Serial No. 631,319.

Issue Division.

All communications should be addressed to The Commissioner of Patents, Washington, D. C.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., October 30, 1900.

Edward N. Dickerson, c/o Foster & Freeman, Assoc., City.

SIR: Your application for a patent for an Improvement in Process of Storing Acetylene Gas filed April 8, 1897, has been examined and Allowed. The final fee, Twenty Dollars, must be paid, and the Letters Patent bear date of a day not later than Six months from the time of this present notice of allowance. If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least Twenty Days prior to the conclusion of the six months allowed them by law. The printing, lithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done after payment of the necessary fees. When you send the final fee you will also send, Distinctly and Plainly Written the name of the Inventor and Title of Invention as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees. If you desire to
324 have the patent issue to Assignee, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of final fee. Additional copies of Specifications and Drawings will be charged for at the following rates; Single Copies, uncertified, 5 cents each. The money should accompany the order.

Very respectfully,
C. H. DUELL,
Commissioner of Patents.

[Printed on left margin:] The within title is that given by the Examiner in charge, as most appropriate to your invention. Should you desire a change in the same, satisfactory reasons Must be given therefore on or before payment of the final fee.

[Printed on right margin:] If payment is made by check or draft, the credit allowed is subject to the collection of the same.

[Printed across face:] In Remitting the Final Fee give the Serial Number at the Head of this Notice.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and languages are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

Amount Received $20. Chief Clerk.

Memorandum of Fee Paid at United States Patent Office.

(Be careful to give correct Serial No.)

Serial No. 631,319.

Inventor:
Edward N. Dickerson.

Patent to be issued to
—— ——.

Name of Invention, as Allowed:
Process of Storing Acetylene Gas.

Date of Payment:
Nov. 1, 1900.

Fee:
$20.00.

Date of Filing:
April 8, 1897.

Date of Circular of Allowance:
Oct. 30, 1900.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

FOSTER & FREEMAN, *Attorneys.*

Send Patent to Box 93, Issue Div.

Indorsed: U. S. Patent Office, Nov. 1, 1900. Chief Clerk.

325 United States Patent Office.

Edward N. Dickerson of New York, N. Y. Process of Storing Acetylene Gas.

Specification Forming Part of Letters Patent No. 662,258, *Dated November* 20, 1900. *Application Filed April* 8, 1897. *Serial No.* 631,319. *No Specimens.*

To all whom it may concern:

Be it known that I, Edward N. Dickerson, of No. 253 Broadway, in the city, county, and State of New York, have invented a new and useful Improvement in Processes of Preventing Explosions and Storing Acetylene Gas under Pressure, of which the following is a full true and exact description.

It is well known that liquefied acetylene gas has at normal temperatures a pressure in excess of six hundred pounds to the square inch. It is also known that highly-compressed acetylene gas under some circumstances can be suddenly decomposed. Acetylene gas is when liquefied in the most condensed from now known, but the pressure is considerable, and for some purposes it would be important to diminish this pressure, at the same time avoiding any risks of a violent decomposition being carried through the mass.

I have discovered that liquefied acetylene gas can be mingled with other liquids—as, for instance, fusel-oil—in such proportions that it becomes practically part of the fusel-oil and is absorbed by or combined with it. This operation likewise reduces the pressure of the liquefied acetylene to a great extent, dependent upon the proportion of liquefied acetylene which may be mingled with or absorbed by the liquid absorbent.

By my process I propose, in the first place, to liquefy acetylene gas according to the process now well known. It can then be transported, if desired, to the place of use. If then it is mingled with a liquid, such as fusel-oil, in suitable proportions, the pressure of the acetylene will be greatly diminished, and the acetylene being mingled with the fusel-oil, will prevent an explosion passing through this mingled mass. Several times the volume of gaseous acetylene can thus be mingled with the absorbent and disappear therein, and this gas will be given off as the pressure is again reduced.

I do not claim to be the first to discover that acetylene can be absorbed by liquids, my invention being limited to the preliminary liquefaction of the acetylene and its subsequent mingling with the absorbent. I do not limit myself to fusel-oil, as other liquids may be employed. Absolute alcohol is a good solvent, though volatile. Acetone is also a solvent.

326 The amount of acetylene to be added to the solvent will be readily determined by the fact that if no more is added that the solvent will dissolve the pressure will be reduced several hundred pounds below that of the liquefied gas. Of course if too much liquefied gas is added the pressure will increase to that of the normal pressure of such liquefied gas.

In practice I provide a cylinder containing a known amount of the solvent. To this I connect the cylinder containing liquefied gas through an intermediate chamber having proper capacity and having stop-cocks above and below. The connection being made, I allow the liquefied gas to pass into the intermediate chamber by opening the upper stock-cock. Then closing this and opening the lower stop-cock the liquefied gas passes into the body with which it is miscible. Then closing the lower stop-cock and the stop-cock upon the receiving chamber the operation is completed.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process of preventing explosions and reducing the pressure of acetylene gas, which consists in mingling liquefied acetylene gas in suitable, miscible proportions with a solvent, such as fusel-oil, and maintaining the same under a reduced pressure, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

E. N. DICKERSON.

Witnesses:

W. LAIRD GOLDSBOROUGH.
F. L. FREEMAN.

48. Gas, Acetylene. Stokes.

1897. B. K.

Contents.

½. Application, 1 papers. O. K.
1. Reject'n, May 10, 1897.
2. Asso. power att'y, May 17, '97.
3. Letter, June 22, 1897.
4. June 18, '97.
5. Reject'n, August 2, 1897.
6. Affidavits, Jan. 25, '98.
7. Reject'n, M'ch 12, 1898.
8. Amendment A, July 23, '98.
9. Reject'n 2, Aug. 16, 1898.
10. Appeal card, Aug. 16, 1900.

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Title: Improvement in Process of Storing Acetylene Gas.

Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 8.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Edward N. Dickerson and Julius J. Suckert, Assignors to United States Acetylene Liquefaction Company, Number 582,274, Granted May 11, 1897, for Improvement in Apparatus for Gasifying and Controlling Liquefied or Compressed Gas. Application filed March 4, 1896.

In testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 14th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

328 No. 582,274.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Edward N. Dickerson and Julius J. Suckert, of New York, N. Y. have presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Apparatus for Gasifying and Controlling Liquefied or Compressed Gas.. They having assigned their rights, title, and interest, in said improvement, to the United States Acetylene Liquefaction Company, of New York, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and have complied with the various requirements of law in such cases made and provided; and

Whereas upon due examination made the said claimants are adjudged to be justly entitled to a patent under the law;

Now therefore these Letters Patent are to grant unto the said United States Acetylene Liquefaction Company, its successors, [heirs]* or assigns for the term of seventeen years from the eleventh

[Words and figures enclosed in brackets erased in copy.]

day of May, one thousand eight hundred and ninety-seven, the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this eleventh day of May in the year of our Lord one thousand eight hundred and ninety-seven, and of the Independence of the United States of America the one hundred and twenty-first.

[SEAL.] JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:

BENJ. BUTTERWORTH,
Commissioner of Patents.

(Here follow photolithographs marked pages 329 to 332.)

(No Model.)

E. N. DICKERSON & J. J. SUCKERT.

329

APPARATUS FOR GASIFYING AND CONTROLLING LIQUEFIED OR COMPRESSED GAS.

No. 582,274. Patented May 11, 1897.

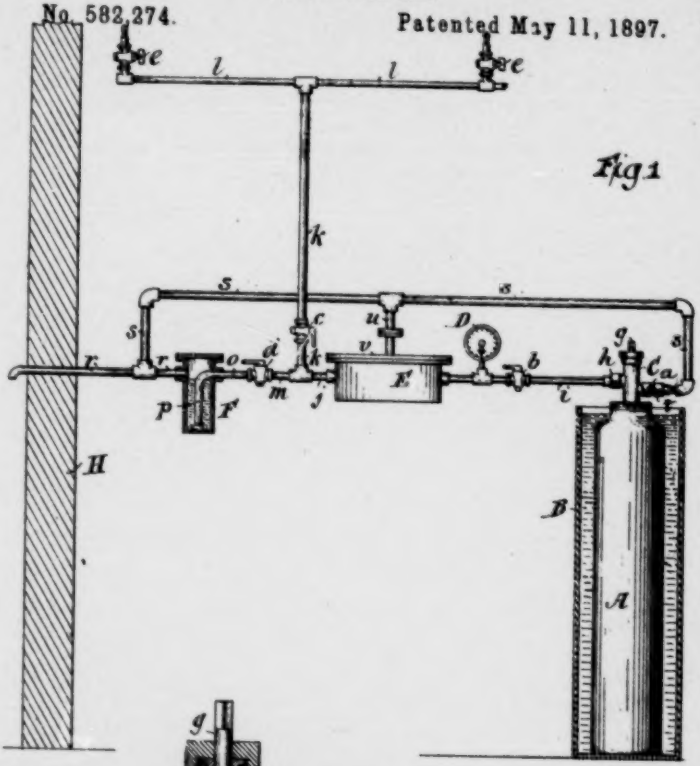


Fig 1

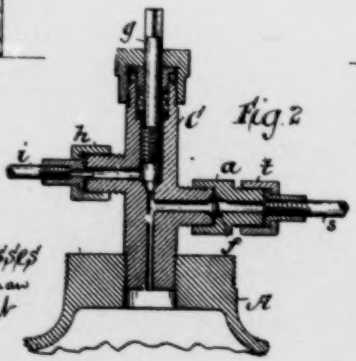


Fig 2

Witnesses
Geo. Wademan
H. Coutant

Inventors
Edward N. Dickerson
Julius J. Suckert
By their attorney
E N Dickerson

UNITED STATES PATENT OFFICE.

EDWARD N. DICKERSON AND JULIUS J. SUCKERT, OF NEW YORK, N. Y., ASSIGNORS TO THE UNITED STATES ACETYLENE LIQUEFACTION COMPANY, OF NEW YORK.

APPARATUS FOR GASIFYING AND CONTROLLING LIQUEFIED OR COMPRESSED GAS.

SPECIFICATION forming part of Letters Patent No. 582,574, dated May 11, 1897.

Application filed March 4, 1896. Serial No. 581,842. (No model.)

To all whom it may concern:

Be it known that we, EDWARD N. DICKERSON and JULIUS J. SUCKERT, of the city, county, and State of New York, have invented a new and useful Improvement in Apparatus for Gasifying and Controlling Compressed or Liquefied Gas, of which the following is a full, true, and exact description, reference being had to the accompanying drawings.

This invention relates to an improved mechanism for allowing the escape of liquefied gas, especially acetylene gas, into a gaseous condition or of compressed gas to a lower pressure, and controlling this operation so as to render the same safe.

In applying liquefied or compressed acetylene gas to the illumination of houses or for other purposes where the gas must be reduced in pressure to enable its practical application it is necessary to effect the reduction in pressure by mechanical appliances technically known as "reducing-valves" and ordinarily operating by means of a diaphragm or piston or float, which, when the reduced pressure exceeds the prescribed limit, closes off, by means of suitable levers, the valve feeding the compressed gas to be reduced in pressure. Again, the tanks containing the compressed or liquefied gas may at times be subjected to intense heat, whereby the pressure generated in the tanks by the expansion of the gas will exceed the bursting pressure of the tanks, thereby causing their rupture. To prevent an excess of pressure in the valve or in the pipes or other apparatus connected with the reducing-valve by reason of the failure of this valve to operate, or by reason of the rupture of the diaphragm, (in case a diaphragm-valve is used,) and also to prevent an excess of pressure developing in the tank through excessive heating of the same are objects of our invention. Our apparatus may be arranged in various forms, but we have shown one embodying our invention.

In the drawings, Figure 1 represents an elevation, partly in section, of our apparatus; and Fig. 2, a sectional view of the valve C, Fig. 1.

A represents a tank containing liquefied or compressed acetylene gas, which is preferably surrounded by water or other suitable liquid contained in the tank B. The tank B may be provided with suitable mechanism—as, for instance, a float-valve—for maintaining the supply of water therein. Attached to the top of the tank A is the valve C, provided with a valve-stem *g*, which on unscrewing permits the gas to escape from the tank A to the outlet-nozzle *h* and through pipe *i* to the diaphragm reducing-valve E. The pipe *i* may be provided with valve stop-cock *b* and pressure-gage D. The gas escaping from the reducing-valve E passes through pipe *j* and can then be utilized for any purpose desired. As shown in Fig. 1, the gas is conducted through pipes *k l* to the burners *e e*, where it is ignited and used for illuminating purposes. The pipe *j* is continued by pipes *m* and *o*, provided with stop-cock *d*, to the liquid-seal trap F, in which the pipe *o* is bent downward, forming a seal, as shown at *p*. The outlet leading from the trap F connects to the pipe *r*, which leads any gas escaping through the seal of the trap through the external wall H of the building and to the outer atmosphere. The outlet *a* on valve C connects directly with the interior of the tank A and therefore enters the valve below the valve-seat, upon which the valve-stem *g* rests. This outlet *a* is provided with diaphragm *f* (shown in Fig. 2) and is connected by means of the pipes *s s* to the pipe *r*.

The diaphragm *f* is preferably made of a fusible alloy—for instance, of an alloy formed of tin, twelve parts; lead, twenty-five parts; bismuth, fifty parts, and cadmium, thirteen parts. It is made of such a thickness that it will burst when the pressure in the tank approximates the fusing-point of the alloy by reason of heat applied to that tank. For instance, if the alloy be fusible at about 150° to 160° Fahrenheit a diaphragm having an opening of one-fourth of an inch should have a thickness of about one-sixteenth of an inch. Under these circumstances, in case of heating of the tank before any excessive pressure could be generated, a double safety is provided by such diaphragm in the fact that it will both fuse and yield at about the same pressure, due to the temperature of the tank. Thus we find that a diaphragm which fuses at about 150° Fahrenheit and which bursts at about

331

two thousand pounds pressure will operate satisfactorily as a double-safety diaphragm under the circumstances stated.

The pipe *u* forms a connection between the pipe *s* and the flanged head *v*, forming a tight cover above the operating-diaphragm of the valve E.

The operation of our device is as follows: In case the diaphragm of the valve E fails to close the valve properly and an excess of pressure passes into the reduced-pressure side of the valve the gas will pass through the liquid seal contained in F and escape through the pipe *r* to the atmosphere. Should the diaphragm of the valve E become ruptured, the gas escaping therefrom will pass through the pipe *s* and the pipe *r* to the atmosphere. The said diagram *f* may be ruptured by an excess of pressure or by heat, as previously described. In replacing a new cylinder A the valve *b* is closed. The valves *d* and *c* also permit the closing off of portions of the apparatus when it is necessary to examine or repair them. In transportation a cap is applied in place of the coupling *i* (shown in Fig. 2) and also, if desired, in place of the coupling *h*.

It is obvious that though we have shown a diaphragm reducing-valve we intend to include thereby any other suitable form of reducing-valve, such as a float-valve having a cup moving in a seal.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The combination with a tank containing compressed or liquefied gas, of a diaphragm burstable at about two thousand pounds pressure and fusible at about 150° Fahrenheit, thereby providing a double-safety diaphragm which will fuse and burst at approximately the pressure and temperature of the gas due to the excessive heating of the tank.

2. The combination in a gas-reducing apparatus, of a cylinder to contain compressed or liquefied gas, a reducing-valve connected to the cylinder, and a burstable and fusible diaphragm f, the valve being set to close at a pressure below that at which the diaphragm will burst, substantially as described.

3. The combination in a gas-reducing apparatus, of a cylinder to contain compressed or liquefied gas, a reducing-valve, a burstable and fusible diaphragm, a safety connection *s*, and a connection *u* above the diaphragm or float of the reducing-valve and communicating with the safety connection *s*, which connection communicates with the atmosphere, substantially as described.

4. The combination with the cylinder A to contain compressed or liquefied gas, of the connection *i*, the reducing-valve E, the escape-seal F connected to the reduced-pressure side of the reducing-valve, a pipe *r*, connected to the escape-seal and communicating to the atmosphere, and a connection *u* above the diaphragm or float of the reducing-valve and communicating with pipe *r*, substantially as described.

5. The combination with a cylinder containing compressed or liquefied gas, of a reducing-valve, a pipe connecting the cylinder and reducing-valve, a valve in said pipe, an independent connection with the cylinder containing a rupturable diaphragm, and a connection between said independent connection and the reducing-valve, substantially as described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

E. N. DICKERSON.
JULIUS J. SUCKERT.

Witnesses:
H. COUTANT,
ANTHONY GREF.

333 Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 9.)

2–390.

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed *in* a true copy from the Records of this Office of the File Wrapper and Contents in the matter of the Abandoned Application of Georges Marie Auguste Claude and Georges Albert Hess, Filed March 1, 1897, Serial Number 625,581, for Improvement in Method of Storing Acetylene Gas for Distribution.

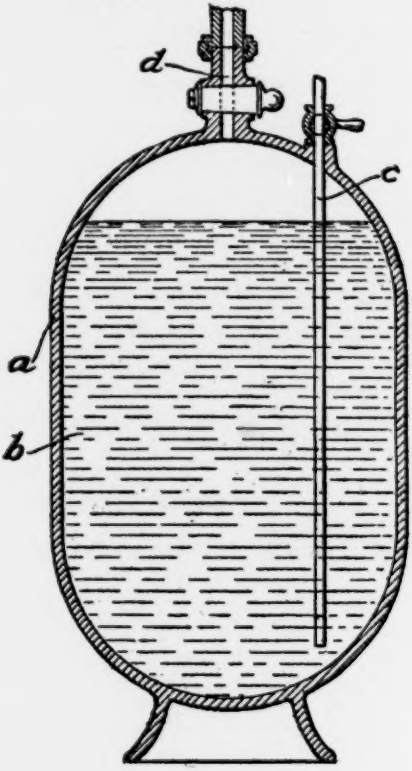
In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 9th day of February, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred*th* and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

334

Fig. 1.



Pat'd Abroad.

(Serial Number)
625,581.

Div. 37.
(Ex'r's Book) $\frac{105}{13}$.

Abandoned.

1897.

Div. 37.

Patent No. —.

Georges Marie Auguste[1] Claude and Georges Albert[2] Hess, Ass'or- to Bruno Abdank-Abakanowicz, of Parc Saint Maur, France,

Of Sainte Mande[1] and Paris[2],
Count- of ——,
[State of]* France.

[* Words and figures enclosed in brackets erased in copy.]

335 Invention: Method of Storing Acetylene Gas for Distribution.

France, 257,679, June 30, 1896. Parts of application filed.

Petition, Mar. 1, 1897.
Affidavit, Mar. 1, 1897.
Specification, Mar. 1, 1897.
Drawing, Mar. 1, 1897.
Model, ——.
Specimen, ——.
Print, Apr. 13, '97.
First fee, cash, $15, Mar. 1, '97.
First fee cert., ——, —.
App. filed complete Mch. 1, '97.

Examined ——, —.
Countersigned: —— ——, For Commissioner.
Notice of allowance, ——, 189–.
Final fee, cash, ——, 189–.
Final fee cert., ——, 189–.
Patented ——, 189–.

Dodge & Sons, As-o., City.

Jos. P. Livermore, Boston, Mass.

Amount Received $15, C'k. Chief Clerk.

To the Commissioner of Patents:

Your petitioners, Georges Marie Auguste Claude and Georges Albert Hess, citizens of the Republic of France, residing respectively in Sainte Mande, France, and Paris, France, pray that Letters Patent may be granted to them for the improvement in Method of Storing Acetylene Gas for Distribution, set forth in the annexed specification; and they hereby appoint Joseph Livermore, of
336 Boston, Massachusetts, their attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGE ALBERT HESS.

Specification.

To all whom it may concern:

Be it known that we, Georges Marie Auguste Claude, a citizen of the Republic of France, residing at Saint Mande, France, and Georges Albert Hess, a citizen of the Republic of France, residing at Paris, France, have invented an improvement in Method of Storing Acetylene Gas for Distribution (for which we have received Letters Patent in France, dated June 30, 1896, No. 257,679), of which the following description in connection with the accompanying drawings is a specification, like letters on the drawings representing like parts.

The present invention relates to a method of storing acetylene gas for distribution in order that the gas may be stored in suitable receptacles and delivered to the consumers, the object being to provide means whereby a large quantity of gas can be stored with safety in a comparatively small receptacle so that renewals need not be too frequently made.

In conjunction with the use of acetylene gas for lighting, heating, etc. several methods of distribution have been heretofore proposed, for example (1) the distribution of the gas through mains after the manner of the illuminating gas now commonly used; (2) the distribution of calcium carbide or other solid compound from which the consumer makes or generates the gas; and (3) the distribution of the gas in cylinders or receptacles, the gas being compressed in the receptacles to the point of liquefaction.

Sept. 17, '97.

337

It is not deemed necessary in the present application to discuss at length the advantages or disadvantages of the various [18] systems, but it may be briefly stated (1) that the distribution of the gas through mains leads to danger owing to the fact that the gas would carry a large amount of acqueo-s vapor, and if any copper or alloy thereof is encountered by the gas when not perfectly dry, acetylene of copper, which is a dangerous fulminate, is liable to be produced; (2) that the distribution of the gas in the form of calcium carbide obviously requires special appliances for the production of the gas by the consumer entailing also attention and care on his part which would be a serious drawback from a commercial point of view; and (3) that the distribution of the gas in liquefied form in cylinders is objectionable and attended with danger, owing to the fact that the normal pressure of the liquefied gas is so great as to necessitate the use of a very heavy cylinder, to sustain the presssure; and further that this, and even more important, to the fact that if the critical temperature (37.5 c.) of the liquefied acetylene is exceeded, the pressure increases suddenly and to an enormous extent.

The last method of distribution, however, viz. the delivery of the gas in cylinders is undoubtedly the most practical method which has thus far been proposed, and if the danger of explosion were eliminated, without materially reducing the amount of gas stored in a receptacle of a given size the use of the gas delivered in this way would undoubtedly be commercially practicable. It is, of course, obvious that the gas might be compressed to a safe degree, but not liquefication, but in this

338

case the quantity of gas stored would be only the capacity of the receptacle times the number of atmosphere of pressure; so that a receptacle large enough to contain a substantial amount of gas would be of such size as to be impracticable for delivery to consumers.

The object of the present invention is to provide means for distributing the gas in holders without reducing the same to a liquid by direct compression, although providing for the storage of a large quantity of the gas in a small place without encountering dangerous pressures or pressures which are liable to be suddenly ncreased to an enormous degree by an increase in temperature or other causes.

In carrying out the invention, a suitable receptacle is provided for the gas, having a faucet or coupling for applying the same to a system of pipes used at the place of consumption or any suitable means for delivering the gas for consumption, and said receptacle is supplied with a liquid capable of dissolving acetylene gas, it having been found that the different alcohols and several other liquids are capable of dissolving many times their volume of acetylene under ordinary pressure, within the limits of practical use, the increase being substantially in direct proportion to the increase in pressures.

While, as stated, there are several liquids which have the necessary properties for carrying out the process, we have found, that acetone is especially suitable for this purpose, and while the invention is not limited to the adoption of this liquid, the

339

following figures may be given as an illustration of the advantages of our invention assuming that acetone is used as the solvent.

Taking for example a closed vessel having a capacity of one litre and supplying it with acetone, if acetylene is then forced in under the pressure of 12 atmospheres (approximately 180 pounds to the square inch) there will be 300 litres of acetylene stored therein, because it is found that acetone is capable of dissolving approximately 25 volumes of acetylene for each atmosphere of pressure. In other words, there will be 25 times as much acetylene stored under a given pressure as there would be if the gas were merely compressed into the vessel without the liquid. By our method, therefore, it will be seen that a large volume of gas is capable of being stored in a comparatively small receptacle and under a comparatively low pressure, so that the said receptacle may be made much lighter than would be the case if the acetylene gas were stored therein under sufficient pressure to liquefy the same. Further than this, it is found that when the gas is held in solution no abnormal or sudden

increase of pressure will take place owing to a rise of temperature or other causes, as is the case with the liquefied acetylene gas.

To illustrate the process, reference may be had to the accompanying drawing, [in which the receptacle a is supplied with a liquid solvent of acetylene indicated by the letter b and provided with an inlet pipe c opening below the surface of the liquid so that gas introduced will pass through and be dissolved in the liquid during the charging process.

Insert A, July 9, '97.

The receptacle is provided with a gas outlet d above the surface of the liquid from which the gas is to be taken for consumption. It is obvious, therefore, that if the liquid used is capable, as in the illustration above given, of dissolving at atmospheric pressure, say 25 times its own volume, and that number of times its own volume for each additional atmosphere of pressure, and the gas is forced in under a pressure of 12 atmospheres, the amount of gas contained in a vessel having a capacity of 1 litre may be expressed in litres by 25 x 12 or 300, all of which would be given up by the liquid against a pressure not exceeding that of the atmosphere. In other words, at a given pressure the capacity of the receptacle would be increased 25 times by the use of the liquid solvent, over its capacity for compressed gas at the said pressure, and would compare favorably in quantity of gas stored with a cylinder of liquefied acetylene which would have not only a dangerously high normal pressure, but a capacity for enormous and sudden increase of pressure under certain circumstances.

In another application, filed herewith, we have described an apparatus adapted to be used in conjunction with the method of storing acetylene for distribution herein described, and consequently do not herein claim such apparatus, and it is to be understood that the present invention is not limited to the specific means for carrying out our invention, herein shown, as illustrative thereof, nor is it intended to limit the invention to any particular liquid specified, since it is obvious that any liquid which is a solvent of acetylene gas may be used.

Insert C.

[* Words and figures enclosed in brackets erased in copy.]

Claims.

Substitute C' [B],* Sept. 17, '97.

1 1. The method of storing acetylene which consists in forc-
2 ing said acetylene under pressure into a liquid, which is a solvent
3 thereof, substantially as described.
1 2. The method of storing acetylene which consists in forcing
2 said acetylene under pressure into a liquid such — acetone,
3 substantially as described.
1 3. The method of storing acetylene gas for distribution,
2 which consists in supplying a closed vessel with a liquid which is a
3 solvent of said gas, and forcing said gas into said vessel under
4 pressure, substantially as described.

[Matter enclosed between rules erased in copy.]

In Testimony Whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT HESS.

Witnesses:

EDWARD P. MacLEAN.
2 MAURINE H. PIGNET.

REPUBLIC OF FRANCE,
City of Paris, ss:

Georges Marie Auguste Claude, and Georges Albert Hess, the above named petitioners, citizens of the French Republic, and residing respectively at Saint-Mande, and Paris, France, being duly sworn, depose and say that they verily believe themselves to be the original first and joint inventors of the Improved Method of
342 Storing Acetylene Gas for Distribution described and claimed in the foregoing specification, that the same has not been patented to them or to others, with their knowledge or consent in any country except in the Republic of France, where a patent was granted to said petitioners on the 30th day of June, 1896, No. 257,679; that the invention has not to their knowledge been in public use or on sale in the United States for more than two years prior to their application, and that they do not know and do not believe that the same was ever known or used prior to their invention thereof.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT HESS.

[* Words and figures enclosed in brackets erased in copy.]

Sworn to and subscribed before me this eleventh day of February, A. D., 1897.

[CONSULAR SEAL.] E. P. MACLEAN,
United States Vice-Deputy General-Consul.

Endorsed: Serial No. 625,581, Paper No. ½. Application. Filed March — 1897. Marie Claude Hess. U. S. Patent Office, Mar. 2, 1897. Division 31. U. S. Patent Office, Mar. 1, 1897. Chief Clerk.

2–260.

Div. —, Room 39.

Address only The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., April 6, 1897.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,581, Method of Storing Acetylene Gas for Distribution.

Filed March 1, 1897.

JOHN S. SEYMOUR,
Commissioner of Patents.

343 The above case has been examined.

Page 4, line 26, should give a brief description of the view of drawings.

It is thought the temperature of the solvent should be given.

The claims are each rejected upon reference to Roscoe and Schorlemmer, Treatise on Chemistry, New York, 1890, Vol. 3, part 2, page 454, paragraph 783. See also Wurta Dictionnarie Du Chemie et Applequee, Tone, 1, partie 1, page 43, Acetylene, solubilite de l'Acetylene. See also The Journal of the Franklin Institute May 1895, Philadelphia, page 326, lines 14-20.

ELY, *Ex'r.*

STOKES.

Endorsed: Serial No. 625,581, Paper No. 1. Rejec. Dated April 6, 1897.

Application of Georges M. A. Claude & Georges A. Hess for Letters Patent. Serial No. 625,581. Filed March 1, 1897. Method of Storing Acetylene Gas for Distribution.

Room 39.

Hon. Commissioner of Patents.

SIR: In the above matter I amend as follows:

Page 4, line 28, after "drawing" erase the remainder of the line and insert—

A. which is a vertical section of an apparatus which may be employed in carrying out the process.

The receptacle *a* is supplied with a

It is respectfully submitted that the references cited in the above entitled application fail to disclose applicant's method or even suggest the possibility of such method. All that is disclosed by the said references is the fact that acetylene is known to be soluble in certain liquids. It is not claimed on behalf of applicants that they have discovered, broadly speaking, a new property of gases in general or acetylene gas in particular, but only that they have discovered and invented gas, which consists in forcing the gas under pressure into a closed chamber containing a liquid which is a solvent thereof, by which process it is found that a much larger quantity of the gas can be stored than is practicable by any method previously devised and can be handled with comparative safety and gives up for consumption when an outlet is afforded therefor from the vessel.

Knowledge of the facts that acetylene gas is soluble, certainly does not render applicants' process obvious, as is fully and conclusively proven by the fact that the property of the gas in ques-
344 tion was known and that a large number of inventors and experimentors have been trying to discover a safe and efficient method of storing this gas, but none of them prior to the applicants have hit upon the method of employing solution and compression of the gas. It is not necessary, where a process is involved, that new properties of matter should be [*be*] discovered in order to render the process patentable. All that the references disclose is the fact that actylene gas is soluble, a property which it shares with nearly all other gases and a property which applicants admit was known prior to their invention. There is, however, no suggestion of the process described in the claims, and it is not thought that the references properly anticipate the invention.

For the foregoing reasons reconsideration is requested.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude & Hess.

July 7, 1897.

Endorsed: Serial No. 625,581, Paper No. 2. Amend't A. Filed July 9, 1897. Claude & Hess. U. S. Patent Office, Jul- 10, 1897. Division 31. United States Patent Office, Jul- 9, 1897.

2–260.

Div. —, Room 39.

Address only The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., July 19, 1897.
Mailed " " "

George Marie Auguste Claude and Georges Albert Hess, care of Jos. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,581, Method of Storing Acetylene Gas for Distribution.
Filed March 1, 1897.

BENJ. BUTTERWORTH,
Commissioner of Patents.

In view of the references of record and in view of the fact that it is an old way to store gas by absorbing it in a liquid—as ammonia in water, there is held to be nothing patentable in the claims
345 and the rejection of April 6, 1897, is repeated and made final.

ELY, *Ex'r.*

Endorsed: Serial No. 625,581, Paper No. 3. Rejec. Dated July 19, 1897.

Application of George M. A. Claude & George A. Hess for Letters Patent. Serial No. 625,581. Filed March 1, 1897. Method of Storing Acetylene Gas for Distribution.

Hon. Commissioner of Patents.

SIR: In the above matter I amend as follows:
Page 2, line 7 after "gas" insert—(for lighting, heating etc.)
Erase the claims and substitute therefor the following:

Substitute C'.

[B.]* 1. The method of storing acetylene, which consists in forcing the same under pressure into a liquid solvent thereof, and confining the solution to maintain the pressure, substantially as described.

2. The method of utilizing acetylene for lighting, heating, etc., which consists in forcing the same under pressure into a liquid solvent thereof, confining said solvent in a receptacle to maintain the pressure, and permitting the gas to escape from the liquid through an outlet in said receptacle, substantially as described.

[Matter enclosed between rules erased in copy.]

Although the last Office action was a final rejection, it is requested that the foregoing amendment be entered for the purpose of appeal, if upon further consideration the rejection is adhered to.

It is respectfully submitted, however, that the references cited in this case utterly fail to disclose the essential step of the process, which consists in utilizing pressure to force the gas into a solvent thereof, so that the solution is, so to speak, supersaturated, whereby the gas, in excess of what is naturally taken up in solution at atmospheric pressure, is given out for consumption against ordinary atmospheric pressure when an outlet is provided therefor.

The advantages of this process have been pointed out in the specification, and it is not seen that any suggestion thereof is found in the prior art as disclosed by the record.

The mere fact that acetylene gas is soluble in certain liquids as described in the references first cited, would not naturally
346 suggest applicants' process; and what is more to the point, had not suggested it in fact up to the time when applicant made the invention.

It is further submitted that it is not old to store gas for use by absorbing it in a liquid, and applicant fails to find any instance wherein ammonia has, strictly speaking, been so stored. Ammonia gas is readily soluble in water, but the solution thereof as commonly made contains only the amount of gas that is dissolved at ordinary atmospheric pressure, and it is used as a solution, rather than as a means for storing the gas, and afterwards separating it from its solvent. If a solution of ammonia gas is exposed to the air it will evaporate rapidly, the gas and liquid disappearing together instead of the gas escaping from the liquid.

So far as disclosed by the record in this case, there is no instance of a supersaturated solution of ammonia gas or any other gas confined under pressure, so that when the said pressure is relieved or lowered the superfluous gas will leave the solvent in a pure form.

[* Words and figures enclosed in brackets erased in copy.]

On the contrary, in cases where ammonia gas is to be used in a pure form, as for example in refrigerating systems, it is customary to condense the gas to liquid form by pressure without using any solvent thereof. In this instance the storage of the ammonia gas is equivalent to the storage of acetylene gas by the compression, which is admittedly old, and open to objections which applicants' inventions aim to obviate.

If applicants' process consisted in nothing more than dissolving acetylene gas in liquid solvent thereof as ammonia gas is dissolved in water for commercial purposes, there would be no substantial quantity of gas given off for use, and applicants' process would be inoperative.

The essential feature of this process, therefore, lies in applying pressure to the gas during the solution thereof, and in maintaining the pressure during the period of storage.

It is thought that this feature of the process is clearly brought out in the claims as now presented, and reconsideration is requested in view of the fact that there is nothing whatever in the state of art as disclosed by the examiner to anticipate the process.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude & Hess.

September 15, 1897.

Endorsed: Serial No. 625,581, Paper No. 4. Amendment B. Filed Sept. 17, 1897. Marie, Claude, Hess. United States Patent Office, Sept. 17, 1897. U. S. Patent Office, Sep. 18, 1897. Division 31.

347 2—60.

Div. —, Room 39.

Address only The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Nov. 2, 1897.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,581, Method of Storing Acetylene Gas for Distribution.

Filed March 1, 1897.

BENJ. BUTTERWORTH,
Commissioner of Patents.

This case was finally rejected on the last action. The amendment presented Sept. 17, 1897, has been entered for the purpose of appeals. As the examiner deems his rejection of the claims correct, the case is still in condition for appeal.

ELY, *Ex'r.*

Endorsed: Serial No. 625,581, Paper No. 5. Letter. Dated Nov. 2, 1897.

2–076.

Appeal No. 22,063 B.

Serial No. 625,581, Paper No. 6.

Appeal.

Name, Claude & Hess.
Filed March 1st, 1897.

Examiners-in-Chief.

Renewal of Appeal, Nov. 23, '99.
Reasons for appeal, May 9, '99.
Examiner's statement, —— 27, '99 " "
Notice of hearing, June 7, "
Brief, " " "
Decision Ex'r rev's'd, " " "
" Ex'r Aff'd, Dec. 16, "
Notice of decision, June 19, 1899.

348 To Commissioner.

Received, ...
Brief, ...
Notice of hearing, ...
Decision, ...
Notice of decision, ...

Associate Power of Attorney.

Inventors, Georges Marie Auguste Claude and Georges Albert Hess. Title, Method of Storing Acetylene Gas for Distribution. Filed March 1st, 1897. Serial No. 625,581.

Hon. Commissioner of Patents.

SIR: Please recognize Dodge & Sons (a firm consisting of W. C. Dodge, W. W. Dodge and H. A. Dodge), of 700 Ninth Street, Washington, D. C., as my associates in the prosecution of the above entitled application.

Respectfully, JOS. P. LIVERMORE, *Attorney.*

U. S. *Venenue* Stamp, 25 cents. D. & S., 6/28/99.

Endorsed: Claude & Hess. Serial No. 625,581, Paper No. 7. Asso. Power of Att'y. Filed June 28, 1899. U. S. Patent Office, Jun- —, 1899. Division 31.

Div. —, Room 39.

Address only The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., June 26, 1899.
Mailed " " "

George Marie Auguste Claude and G. A. Hess, care of Dodge & Sons, Washington, D. C.:

349 Please find below a communication from the Examiner in charge of your application, No. 625,581, Method of Storing Acetylene Gas for Distribution.
Filed March 1, 1897.

C. H. DUELL,
Commissioner of Patents.

In this application the decision of the examiner was reversed by the Examiners in Chief on appeal but in such appeal the Board stated reasons, which had not been urged by the primary examiner, but which in their judgment was sufficient to negative patentability in the claims. Those reasons which applicant has had furnished to him, as a copy of the decision has been sent to him, were based on extracts from Wurtz Dictionary of Chemistry, 1875, Vol. 2, page 791, et seq., and page 801, and from a "Treatise on Beverages" Sulz, 1888, pages 119, 123, and 421. For the reasons stated by the Examiners-in-Chief, the claims are rejected.

ELY, *Ex'r.*

Endorsed: Serial No. 625,581, Paper No. 8. Rejec. Dated June 28, 1899.

United States Patent Office.

Room No. 39.

Georges M. A. Claude and Georges A. Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1st, 1897. Serial No. 625,581.

Hon. Commissioner of Patents.

SIR: We hereby amend by inserting at the end of the present description the following:

C. "Though it has long been known that various gases are soluble in one or another liquid, and that the quantity of gas dissolved in or by a given liquid varies in proportion to the pressure under which the gas is introduced, we have made new or additional discoveries show-ng that gas so dissolved and held by a liquid solvent can be drawn off at relative low but uniform pressure, as required for its proper consumption; and that although the relatively small quantity of
350 free gas in the receptacle above the solvent may be ignited, the gas still in solution is not affected.

While for experimental purposes and to determine the properties of gases and of their solvents, various gases have been forced under pressure into solvents, it has never before been proposed, so far as we are advised, to store gases in this manner, or to thus hold them for considerable periods of time subject to withdrawal as required for consumption or use, nor in any case to withdraw them under regulated or uniform pressure at the point escape into the main or distributing pipe. In other words, we have turned to useful account, through the aid of further discovery and development, which was previously a mere scientific fact in physics, and we have thereby produced or developed a safe, practicable, and most valuable mode or method of storing, distributing, and applying to use, a gas which heretofore has been capable of storage and distribution only in vessels of great strength and of
C. relatively small capacity, wherein the entire volume is subject to explosion; or which has *required to be* generated at *the time and place of consumption.*"

Cancel the claims and substitute:

C'. "1. The herein described method of storing and delivering gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which is directly controlled by and proportionate to the pressure of the gas within the holder.

2. The herein described method of storing and distributing gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a close chamber and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure, in quantity directly proportionate to the rate of consumption or use.

3. The method of storing and distributing acetylene, which consists in forcing the same under pressure, into a liquid solvent of acetylene, in a close vessel, sealing said vessel; trans-
C'. porting the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally

opening communication between the vessel and the
351 main and permitting the gas to flow from the vessel to the burners under its own pressure at a uniform rate."

Respectfully,

GEORGES M. A. CLAUDE,
GEORGES A. HESS,
By DODGE & SONS,
Associate Att'ys.

Washington, D. C., Sept. 15th, 1899.

Endorsed: Claude and Hess. 625,581, Paper No. 9. Amend't C. Sept. 18, 1899. Cla. U. S. Pantent Office, Sep. 18, 1899. Division 31.

United States Patent Office.

Room No. 39.

Georges M. A. Claude and Georges A. Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1st, 1897. Serial No. 625,581.

Hon. Commissioner of Patents.

SIR: In presenting the accompanying amendment we are not unmindful of the decision recently rendered by the Board of Examiners-in-Chief in this case. Said decision, however, was based upon matters not brought forward by the Examiner, and consequently not considered by us prior to the appeal. Being taken by surprise, and not in position fully to discuss the matters thus first brought forward, it is of course our privilege to have the judgment of the Examiner, and if need be, the judgment of higher tribunals, on the case, treated in the light of these new citations.

The accompanying amendment is believed to set forth a clear and proper line of demarcation between what has previously been done, and what is done by applicants.

As further bearing upon and elucidating the case, we present herewith a copy of the printed brief before the Board of Examiners-in-Chief on appeal, remarking, however, in passing that the statements in said brief as to the references cited by Examiner while believed to be correct as to those references, require perhaps some qualification in the light of the matters noted in the decision of the Board. The brief is presented as explaining more fully the peculiarities and special [advan-ges] of applicants' method.

Respectfully,

DODGE & SONS,
Associate Att'ys.

352 Washington, D. C., Sept. 15th, 1899.

Endorsed: Serial No. —, Paper No. —. Filed —— —, 1899. U. S. Patent Office, Sep. 18, 1899. Division 31.

Div. —, Room 29.

Address only The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., September 28, 189–.
Mailed " " "

Georges Marie Auguste Clause and George Albert Hess, c/o Dodge & Sons, Washington, D. C.:

Please find below — communication from the Examiner in charge of your application, No. 625,581, filed March 1, 1897, "Method of Storing Acetylene Gas for Distribution."

C. H. DUELL.
Commissioner of Patents.

This application as amended September 18, 1899, has been again considered. It is held that there is nothing patentable in the claims or in the case over the references and reasons of record. The claims are accordingly rejected.

ELY, *Examiner.*

Endorsed: Serial No. 625,581, Paper No. 10. Rej. Dated Sep. 28, 1899.

United States Patent Office.

C. M. A. Claude & G. A. Hess. Method of Storing Acetylene Gas for Distribution. — March 1st, 1897. Serial No. 625,581.

Hon. Commissioner of Patents.

SIR: The claim in this case having been entirely rewritten since the former appeal, and in the light thereof, and having been but once rejected in their present form, we respectfully ask reconsideration, and particularly desire that the matter set forth in the
353 recent amendment be given careful consideration. If with this before him, and thus considered, Examiner shall still be unable to see anything patentable in the invention over the references, he will of course give a final rejection, which will place the case in condition for appeal to the Board. Applicants are entitled to take the matter again before the Board in its present shape, in view of the fact that they were taken by surprise when previously be-

fore that tribunal, and the rejection was based upon matters not previously set forth by the Examiner.

Respectfully,

G. M. A. CLAUSE,
G. A. HESS,
By DODGE & SONS,
Associate Atty's.

Washington, D. C., October 24th, 1899.

Endorsed: Clause & Hess. Serial No. 625,581, Paper No. 11. Letter. Filed Oct. 27, 1899. U. S. Patent Office, Oct, 27, 1899. Division 31.

Div. —, Room 39.

Address only The Commissioner of Patents, Washington, D. C.

Paper —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., November 4, 1899.
Mailed " " "

Georges Marie Auguste Clause and Georges Albert Hess, care of Dodge & Sons, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 625,581, Method of Storing Acetylene Gas for Distribution.

Filed March 1, 1897.

C. H. DUELL,
Commissioner of Patents.

In response to the letter of Oct. 27, 1899, in this case, the examiner has to state that on reconsideration he is unable to find anything patentable in the claims. The claims are therefore again and finally rejected for the reasons and on the references of record as set forth in the office letter of June 20, 1899, and in the decision of the Examiners-in-Chief.

ELY, *Ex'r.*

354 Endorsed: Serial No. 625,581, Paper No. 12. 2nd Rejec. Dated Nov. 4, 1899.

Docket Clerk,
Dec. 12, 1910,
U. S. Patent Office.

WASHINGTON, D. C., December 12, 1910.

Hon. Commissioner of Patents, U. S. Patent Office, Washington, D. C.

SIR: By virtue of the order of the Court (U. S. Circuit Court, Northern District of Ohio, Eastern Division Killets) filed herewith, I respectfully request permission to inspect the file of abandoned application of Claude & Hess, on Method of Storing Acetylene Gas, Serial No. 625,581, filed March 1, [*1907*], and also appeal files therein, Nos. 22,063 B and 22,453 B, and to obtain certified copies of the file wrappers and contents in said application and appeals.

Respectfully, DELBERT H. DECKER.

Docket Clerk,
Dec. 12, 1910,
U. S. Patent Office.

THE UNITED STATES OF AMERICA,
Northern District of Ohio,
Eastern Division, ss:

At a stated term of the Circuit Court of the United States, within and for the Eastern Division of the Northern District of Ohio, begun and held at the City of Cleveland, in said District, on the first Tuesday in October, being the fourth day of said month, in the year of our Lord, one thousand nine hundred and ten, and of the Independence of the United States of America, the one hundred and thirty-fifth, to-wit, on Friday, the 9th day of December, A. D. 1910.

Present: Honorable John M. Killits, United States District Judge.

Among the proceedings then and there had were the following, to-wit:

No. 8063. In Equity.

THE COMMERCIAL ACETYLENE COMPANY and THE PRESTOLITE COMPANY
vs.
THE AUTO-ACETYLENE LIGHT CO., LLEWLLYN C. YOUNG et al.

355 This cause coming on for hearing upon a motion for a preliminary injunction on Patent No. 664,383, and it appearing to the court that the defense of said motion requires the opening for examination by counsel for defendants of abandoned application No. 625,581, applied for by Claude and Hess on March 1st, 1897.

It Is Hereby Ordered, Adjudged and Decreed that this cause be

held open until defendants' counsel can have an opportunity to examine the files of said application and secure certified copy thereof, and The Honorable Commissioner of Patents is respectfully requested to open said files for the above examination and permit said copy to be made.

THE UNITED STATES OF AMERICA, *ss:*

I, B. C. Miller, Clerk of the Circuit Court of the United States, within and for the Northern District of the State of Ohio, do hereby certify that I have compared the within and foregoing transcript with the original Order to hold cause open entered upon Journal of the proceedings of said Court in the therein entitled cause, at the term, and on the day therein named; and do further certify that the same is a true, full and complete transcript and copy thereof.

Witness, my official signature and the seal of said Court at Cleveland, in said District, this 10th day of December, A. D., 1910, and in the 135th year of the Independence of the United States of America.

[— States of America Court Seal.]

B. C. MILLER, *Clerk,*
By R. C. DEAN,
Deputy Clerk.

Endorsed: Serial No. 625,581, Paper No. 13. No. 8063. United States Circuit Court, Northern District of Ohio, Eastern Division. The Commercial Acetylene Light Co. and The Prestolite Company, vs. The Auto Acetylene Light Co., Llewllyn C. Young et al. Certified Copy of Order to hold cause open. Approved Dec. 12, 1910. E. B. Moore, Commissioner.

48 Gas
Acetylene-
Liquefied.

1897.

Contents.

Application, 1 papers. O. K.
1. Rejection, April 6, 1897.
2. Am'd't A, July 9, '97.
3. Rejected, July 19, 1897.
4. Amendment B, Sept. 17, '97.
5. Letter, Nov. 2, 1897.

356 6. Appeal card, May 9, 1899.
7. Asso. power of att'y, June 28, '99.
8. Rej., June 28, 1899.
9. Amend't C, Sept. 18, 1899.
10. Rej., Sept. 28, 1899.
11. Letter, Oct. 27, 1899.

12. Rej. 2d, Nov. 4, 1899.
13. Authority to inspect, Dec. 12, 1910.
14.
15.
16.
17.
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21.
22.
23.

Title: Improvement in —.

Endorsed: U. S. Patent Office. Copy Made Feb. 8, 1911. 17,859/11. M. H. M. E. K.

(DEFENDANTS' EXHIBIT No. 10.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents of the Appeal to the Examiners-in-Chief number 22,063 B, filed May 9, 1899 and Renewal thereof filed November 23, 1899, in the matter of the Application of Georges M. A. Claude and Georges A. Hess, Filed March 1, 1897, Serial Number 625,581, for Improvement in a Method of Storing Acetylene Gas for Distribution.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 9th day of February, in the year of Our Lord One Thousand Nine Hundred and eleven, and of the Independence of the United States of America the one hundred and thirty-fifth.

F. A. TENNANT,
Assistant Commissioner of Patents.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

357 Serial Number 25,581. (Ex'r's Book.)

1899.

Examiners-in-Chief,
May 13, 1899,
U. S. Patent Office.

Examiners-in-Chief,
Nov. 29, 1899,
U. S. Patent Office.

Appeal to the Examiners-in-Chief.

22,453 B.

No. 22,063 B.
Georges M. A. Claude and Georges A. Hess of ——,
County of ——,
State of ——.
Method of Storing Acetylene for Distribution.
Rec'd May 9, 1899.
Petition " " "
Cash, $10, May 9, 1899.
Cert. Dep. ——.
2. Jos. P. Livermor,
3. 40 Water St., Boston, Mass.

BOSTON, MASS., May 8, 1899.

Hon. Commissioner of Patents, Washington, D. C.

DEAR SIR: We hereby appeal to the Examiners in Chief from the decision of the Principal Examiner in the matter of our application for Letters Patent for a Method of Storing Acetylene for Distribution, filed March 1, 1897, Serial No. 625,581, the claims of which were a second time rejected July 19, 1897.

The following are assigned as the reason for appeal;

The Principal Examiner erred in ruling that the method was anticipated by the references cited.

The Principal Examiner erred in ruling that the invention was not patentable in view of the state of the art.

The Principal Examiner erred in holding that the claims should not be allowed.

Respectfully submitted,

GEORGE M. A. CLAUDE,
GEORGES A. HESS,
By JOS. P. LIVERMORE,
Their Attorney.

358 Endorsed: Appeal No. 22,063. Serial No. 625,581, Paper No. 1. Reason of appeal. Dated May 9, 1899. Claude & Hess. Examiners-in-Chief. May 13, 1899, U. S. Patent Office.

U. S. Patent Office,
May 12, 1899,
Mailed.

No. 625,581.

Georges Marie Auguste Claude and Georges Albert Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1, 1897.

Appeal to the Board of Examiners-in-Chief.

Examiner's Statement.

Appeal has been taken from the rejection of the following claims:

1. In a method of storing acetylene, which consists in forcing the same under pressure into a liquid thereof, and confining the solution to maintain the pressure, substantially as described.

2. The method of utilizing acetylene for lighting heating, etc., which consists in forcing the same under pressure into a liquid solvent thereof, confining said solvent in a receptacle to maintain the pressure, and permitting the gas to escape from the liquid through an outlet in said receptacle, substantially as described.

The references are:

Roscoe and Schorlemer, Treatise on Chemistry, New York, 1890, Vol. 3, part 2, page 454, paragraph 783; Wurtz, Dictionaire du Chemie Pure Et Applique Tome 1, partie, page 43, Acetylene, Solubilite de l'Acetylene.

Journal of the Franklin Institute May 1895, Philadelphia, page 326 lines 14-20.

These articles show the solubility of acetylene in various substances such as water, carbon bisulfid, petroleum, chloroform, glacial acetic acid and absolute alcohol, and the amount of acetylene which will be held in solution by these varies from one volume to six volumes.

It may be remarked that there is a mistake in Roscoe and Scharlemmer, 625,581 2 regarding the solubility of acetylene in glacial acetic acid and absolute alcohol; those writers intimate that it requires six volumes of either of these liquids to dissolve one volume of acetylene; whereas one volume of either of these liquids dissolves six volumes of acetylene. The coefficient 6 is misplaced.

359 Attention has also been called to some of the well known instances in which gas is stored by dissolving the gas in a liquid. The only instance mentioned in this case is that of ammonia in water; in the companion case which is simultaneously on appeal reference has been made to the storing of hydrochloric acid gas and of formaldehyde gas by dissolving it in water. The case of ammonia in water is a noteworthy case. As one volume of water will dissolve from 1,000 to 1,100 volumes of ammonia without much increase of pressure it is perfectly obvious that instead of trying to compress ammonia gas into a vessel the preferable way of storing ammonia is not to compress it by itself into a vessel but to cause it to be ab-

sorbed by water. An ordinary bottle corked in the usual way will hold 1,000 or 1,100 volumes of ammonia gas if it be dissolved in water, but it is patent that to hold 1,000 or 1,100 volumes of ammonia by mere compression would require a vessel capable of withstanding immense pressure. This is well recognized. It is also a common way when one wishes to use ammonia gas, to obtain the gas from its solution in water, just as the examiner himself has derived formaldehyde gas by evaporation from the aqueous solution which is known as formalin and which contains about 500 volumes of formaldehyde gas to one volume of water.

625,581.

Applicants have, as far as the claims go, merely made a double use of this old process and their claims, as drawn, cannot possibly possess any patentability.

While applicants' claims as drawn are obviously without patentability, it may be suggested that there may be some patentability in applicants' proposal if the claim be properly limited and for this reason.

Applicants appear, as far as the examiner has been able to ascertain, to have [seen] the discoverers of the large absorbtive powers of acetone for acetylene gas. But the claims are not limited to acetone but are so broad as to include the known solvents of acetylene which have been specified. And it is also suggested that the mere [st-ring] of acetylene is without utility; any patentable claim should include the recovery of the acetylene from its solution and in such a way as to possess utility. The examiner would therefore suggest that possibly some such claim as the following might be allowable.

The method of storing and using acetylene consisting in the following steps: first storing the acetylene by filling a vessel capable of withstanding considerable pressure with acetone, and impregnating such acetone with acetylene under pressure of several atmospheres,
and then in using the acetylene by relieving the pressure, per-
360 mitting the gas to be spontaneously evolved from the acetone
and finally conducting the gas so its place of use through suitable pressure regulating devices.

Such a claim, it is submitted might be patentable as it gives the applicants the benefit of their discovery of the large absorptive powers of acetone for acetylene—and it appears to the examiner that there is nothing expressed in the above claim which is not necessary to give effect to the discovery of these applicants. It is submitted that there can be no patentability in any claim which would include the known solvents of acetylene, as any such claim would cover only a double use of what has been shown to be notoriously old.

Respectfully submitted,

G. S. ELY, *Examiner.*

May 12, 1899.

Div. XXXI.

Endorsed: Appeal No. 22,063. Serial No. 625,581, Paper No. 2. Examiner's Statement. Dated May 12, 1899. Claude and Hess. Examiners-in-Chief, May 13, 1899. U. C. Patent Office.

Copy.

2–201.

Room No. 242.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., May 13, 1899.

Georges M. A. Claude and Georges A. Hess, c/o Jos. P. Livermore, Boston, Mass.

SIR: The appeal from the decision of the Examiner in the case of Claude and Hess for a patent for an improvement in a Method of Storing Acetylene Gas for Distribution filed Mar. 1, 1897, Serial No. 625,581, will be heard by the Examiners-in-Chief, Wednesday June 7/99 at 2.30 P. M.

If appellant, or his attorney, shall not appear at that time the hearing will be regarded as waived, and the case will be decided upon the record.

Very respectfully,

C. H. DUELL,
Commissioner of Patents.

361 Endorsed: Appeal No. 22,063. Serial No. 625,581, Paper No. 3. Notice of Hearing. Dated May 13, 1899. Claude and Hess. Examiners-in-Chief. May 13, 1899. U. S. Patent Office.

Paper No. 4, Not in File Wrapper.

No. 22,063.

U. S. PATENT OFFICE, June 19, 1899.

Before the Examiners-in-Chief, on Appeal.

Application of Georges Marie Auguste Claude and George Albert Hess for a Patent for an Improvement in Methods of Storing Acetylene Gas for Distribution. Filed March 1, 1897. Serial No. 625,581.

Mr. Jos. P. Livermore for Appellant.

The claims appealed are:

"1. In a method of storing acetylene, which consists in forcing the same under pressure into a liquid solvent thereof, and confining the solution to maintain the pressure, substantially as described.

"2. The method of utilizing acetylene for lighting, heating, etc., which consists in forcing the same under pressure into a liquid solvent thereof, confining said solvent in a receptacle to maintain the

pressure, and permitting the gas to escape from the liquid through an outlet in said receptacle, substantially as described."

The references cited are:

Treatise on Chemistry, Roscoe & Schorlemer, N. Y. 1890, Vol. 3, part 2, p. 454, paragraph 783;

Wurtz's Dictionnaire due Chemie Pure et Applique Tome 1, partie, p. 43, Acetylene, Solubilite de l'Acetylene;

Journal of the Franklin Institute, May, 1895, Philadelphia, p. 326, lines 14-20.

The references cited by the Examiner show only the solubility of acetylene in various substances.

It is urged on behalf of the applicants that there is nothing whatever in any of the references to disclose a "method" of storing acetylene gas or other illuminating gas for distribution by utilizing a solvent.

It is true that none of these references discloses any such idea. Patents are not granted for ideas merely, but for the means by which those ideas are actually embodied. These means are old and well known means for super-saturating liquids with gases by forcing the gases under pressure into the liquid and confining the solu-
362 tion therein to maintain the pressure. Thus we find it stated in Wurtz's Dictionary of Chemistry, 1875, Vol. 2, page 791, that:

"The amount of gas absorbed by a liquid on which it exerts no chemical action is dependent (1) on the specific nature of the gas and of the liquid; (2) on the temperature at which the absorption takes place and (3) on the *pressure* under which the absorption takes place."

On the pages following this quotation are given the various experimental data by means of which Bunsen verified the law which had been stated as early as 1803 by McHenry in the Philosophical Transactions of the Royal Society of London, No. 1, p. 29. This law is, moreover, well known to those familiar with the art of carbonating liquids. Thus on page 119 of a "Treatise on Beverages," Sulz, 1888, we find it stated:

"We have already mentioned that water absorbs a greater amount of carbonic acid with increased pressure. It is found by experiment that this amount increases in proportion to the pressure as follows: At the pressure of one atmosphere (14.7 lbs.) the water will absorb its own volume; at the pressure of two atmospheres, twice its own volume; at three atmospheres, three times its own volume, and soon, until at about 540 lbs. to the square inch, the carbonic acid gas itself becomes a liquid, as was discovered by Faraday in 1823."

That the gas so contained in the liquid will escape when the pressure is removed is also well known. See, for example, page 801 of Vol. 2 of Wurtz's Dictionary above referred to, and page 123 of Sulz's Treatise on Beverages.

It is there stated that:

"As soon as the pressure in the cylinder gets diminished by letting escape its surface gaseous contents, a certain amount of the gas

already absorbed by the liquid is eliminated in consequence of the decreased pressure."

And again on page 421 it is stated that the gaseous contents of a fountain are sometimes entirely lost by the escape of gas, owing to poor connections.

Obviously there was no idea of utilizing this carbonating apparatus as a means of storing carbonic acid gas, since there was no difficulty in transporting liquefied gas itself.

These citations are sufficient to show that it is within the knowledge of those familiar with the art that the quantity of gas which will be absorbed by a liquid increases as the pressure thereon
363 is increased, and that when this pressure is diminished the gas will escape.

Claim 1 covers two steps; first, the forcing of acetylene under pressure into a liquid solvent thereof, and second, confining the solution to maintain the pressure. Clearly this is a double use of the old process of forcing carbonic acid gas into water. It was known that acetylene was soluble and presumably the laws applicable to the absorption of other gases by a liquid applied to acetylene. It was equally obvious that gas would escape from a super-saturated solution when the pressure was relieved. And this is the method of claim 2.

While on the record presented by the Primary Examiner we are unable to hold that these claims are lacking in patentable novelty, and must accordingly reverse his decision, the attention of the Commissioner is called to these additional facts which seem to us to negative the novelty of both these process claims.

The decision of the Examiner is reserved.

J. H. BRICKENSTEIN,
S. W. STOCKING,
T. G. STEWARD,
Examiners in Chief.

Endorsed: Appeal No. 22,063. Serial No. 625,581, Paper No. 5. Decision. Dated June 19, 1899. Claude and Hess. Examiners-in-Chief. Jun- 19, 1899. U. S. Patent Office. Recorded, Vol. 66, p. 57.

Renewal of Former Appeal.

To the Commissioner of Patents.

SIR: We hereby appeal to the Examiners-in-Chief from the decision of the Principal Examiner in the matter of our application for Letters Patent for Method of Storing Acetylene Gas for Distribution, filed March 1st, 1897, Serial No. 625,581, which on the 4th day of November, 1899, was a second time rejected as to all three claims in the case.

The grounds of the appeal are that the claims are not met in terms or in substance by the references cited, nor unpatentable on the grounds alleged.

In this case an appeal was taken to and decided by the Board, but the decision was based upon matters discovered by the Board

and not set up by the Examiner. Thereafter the case was amended in the light of these matters, and being again rejected is brought a second time to the Board for its judgment upon the claims as amended.

364 It is desired to present the case orally.

Respectfully,

GEORGES M. A. CLAUDE,
GEORGES A. HESS,
By DODGE & SONS,
Associate Att'ys.

Washington, D. C., Nov. 23d, 1889.

Endorsed: Appeal No. 22,453. Serial No. 625,581, Paper No. 7. Reasons of Appeal. Dated Nov. 23, 1899. Claude and Hess. Second Appeal. U. S. Patent Office, Nov. 23, 1899. Examiners-in-Chief. Nov. 29, 1899. U. S. Patent Office.

U. S. Patent Office,
Nov. 27, 1899,
Mailed.

Application of M. A. Claude and Georges A. Hess. No. 625,581. Method of Storing Acetylene Gas for Distribution. Filed March 1, 1897.

Appeal to the Board of Examiners-in-Chief.

Examiner's Statement.

This is a renewal of an appeal taken may 9, 1899. The claims appealed are as follows:

1. The herein described method of storing and delivering gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which is directly controlled by and proportionate to the pressure of the gas within the holder.

2. The herein described method of storing and distributing gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a close chamber and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure in quantity directly proportionate to the rate of consumption or use.

3. The method of storing and distributing acetylene, which consists in [corcing] the same under pressure, into a liquid solvent of acetylene, in a closed vessel; sealing said vessel; transporting

365 the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally opening communication between the vessel and the main and permitting

the gas to flow from the vessel to the burners under its own pressure at a uniform rate.

Inasmuch as this application has once before been on appeal, it seems unnecessary to go into the reasons the examiner sees for the rejection of the claims. It is thought that it will be sufficient to merely refer to the examiner's prior statement and to the decision of the Examiners-in-Chief. The examiner has added to the reasons for rejecting the claims, the reasons given by the Examiners-in-Chief. These were in brief extracts from Wurtz' Dictionary of Chemistry, Vol. 2, page 791, and Vol. 2, page 801, and also extracts from a Treatise on Beverages, Sulz, 1888, on pages 119, 123 and 421.

ELY,
Ex'r Div. 31.

Endorsed: Appeal No. 22,453. Serial No. 625,581, Paper No. 8. Examiner's Statement. Dated Nov. 27, 1899. Claude & Hess. Second appeal. Examiner-in-Chief. Nov. 29, 1899. U. S. Patent Office.

2–201.

Room No. 242.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Copy.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Nov. 29, 1899. *190.*

Georges M. A. Claude and Georges A. Hess, c/o Dodge and Sons, City.

SIR: The 2d appeal from the decision of the Examiner in the case of Claude and Hess for a patent for an improvement in a Method of Storing Acetylene Gas for Distribution, filed Mar. 1, 1897 [190–]* Serial No. 625,581, will be heard by the Examiners-in-Chief Monday Dec. 11/99 at 1-30 P. M.

If appellant or his attorney, shall not appear at that time the hearing will be regarded as waived, and the case will be decided upon the record.

Very respectfully,

C. H. DUELL,
Commissioner of Patents.

366 Endorsed: Appeal No. 22,453. Serial No. 625,581, Paper No. 9. Notice of hearing, dated Nov. 29, 1899. Claude and Hess. Second Appeal. Examiners-in-Chief. Nov. 29, 1899. U. S. Patent Office.

[Words and figures enclosed in brackets erased in copy.]

United States Patent Office.

Georges Marie Auguste Claude and Georges Albert Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1st, 1897. Serial No. 625,581.

Application for Patent.

On Appeal to the Board of Examiners-in-Chief.

Brief for Applicants.

Statement of Case.

This application was before this Board through an appeal taken May 9th, 1899, and decided on or about the 7th of June, 1899.

The claims involved in the present appeal differ from those previously appealed, and are drawn in the light of the matters to which the Board in its decision directed the attention of the Commissioner, and in view of which it recommended rejection of the case.

In the decision on the previous appeal, it was held with regard to the references cited by the Examiner and set up in his statement that—

"It is true that none of these references discloses any such idea."

The decision, however, cited certain publications, and quoted therefrom, as showing that the subject matter of the claims then appealed was not novel or patentable.

In view of this action the Examiner, upon the return of the application to his jurisdiction, rejected the case upon the citations made by this Board. Thereupon, applicants amended their specification to draw a distinction between it and the prior art as disclosed in the citations made in the decision of this Board, and substituted new claims for those previously appealed, and have now renewed their appeal with a view to obtaining a ruling upon the substitute claims.

The claims appealed are as follows:

1. The herein described method of storing and delivering gas, which consists in forcing the gas under pressure into a liquid
367 solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which is directly controlled by and proportionate to the pressure of the gas within the holder.

2. The herein described method of storing and distributing gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a close chamber and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure in quantity directly proportionate to the rate of consumption or use.

3. The method of storing and distributing acetylene, which con-

sists in forcing the same under pressure, into a liquid solvent of acetylene, in a closed vessel; sealing said vessel; transporting the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally opening communication between the vessel and the main and permitting the gas to flow from the vessel to the burners under its own pressure at a uniform rate."

The rejection of the Examiner, from which this appeal is taken, was based upon the citations made in the decisions of this Board, and these are therefore the only matters requiring consideration in connection with the foregoing claim.

It is conceded that the idea of charging liquid solvents of different gases with such gases is old and well known, and further that the quantity of any given gas which will be taken up by a given solvent increases with increase of the pressure under which the gas is introduced. Without any pressure whatever, but merely through contact, a considerable number of volumes of a gas will be taken up by a given solvent, the number of volumes varying with the gas and the solvent selected.

A solvent thus charged with the maximum quantity of gas which the solvent will take up at atmospheric pressure, or popularly speaking, without any pressure, may be said to be saturated with the gas, or the solution may be termed a saturated solution.

When such solvent is charged with the gas under pressure, a supersaturated solution is produced, and, as above indicated, the broad idea of making a supersaturated solution of different gases with their solvents is a well established scientific possibility or fact.

368 It may also be admitted that in the case of such supersaturated solution, the gas above or beyond the quantity required to effect such saturation, will, if the upper portion of the vessel be vented, separate out of the solvent, and escape or flow off.

While this much has long been known, and while water has been charged with carbonic acid gas which served to expel the charged water from the fountain or holder, no prior instance has been brought to view where a gas of any kind has thus been stored and withdrawn from above the solvent wholly independent and free thereof, *at uniform pressure or in regulated quantity*, as is necessary in order to permit the practical storage and distribution of illuminating gases.

This uniform pressure in the main or distributing pipe can only be attained through the intervention of some sort of reducing or pressure controlling means. While varying forms of apparatus may be employed, and while in another application one such form is set forth, it is not obvious from anything which preceded the present discovery or invention, that the scientific fact as to the possibility of charging a liquid solvent with many volumes of gas could be turned to useful account, or availed of for the practical storage and distribution of illuminating or other gases. Certainly it was not apparent from anything previously produced, how the gas once stored in the solvent, was to be withdrawn and utilized in a practical way for the purpose of lighting or heating.

If the vessel containing the supersaturated solution were immediately or directly connected with the main, that is to say, if no re-

ducing or pressure regulating device were interposed between the holder and the burner or other gas consuming device, there would be enormous pressure and such free and rapid delivery of the gas in the first instance as would either cause a great percentage to be unconsumed and to escape into the atmosphere, or would blow out a lighting flame, by the force with which it escapes. As the pressure decreased, this effect would gradually lessen, and a burner or other consuming device adapted for a relatively high pressure, would, when the pressure fell materially, receive an inadequate supply. It is therefore obvious that merely making the burner openings or jet orifices of very small dimensions, with a view of preventing too rapid escape under full pressure, would so retard the escape of gas as to preclude proper action of the apparatus after a material portion of the gas should be drawn off, and the pressure be proportionately reduced.

In substituting the above quoted claims for those originally made, and in view of the quotations made by this Board [*Board*] 369 in its decision,—and upon which the present rejection is based, the following statement was introduced into the specification in advance of the claims:

"Though it has long been known that various gases are soluble in one or another liquid, and that the quantity of gas dissolved in or by a given liquid varies in proportion to the pressure under which the gas is introduced, we have made new or additional discoveries showing that gas so dissolved and held by a liquid solvent can be drawn off at relatively low but uniform pressure, as required for its proper consumption; and that although the relatively small quantity of free gas in the receptacle above the solvent may be ignited, the gas still in solution is not affected.

While for experimental purposes and to determine the properties of gases and of their solvents, various gases have been forced under pressure into solvents, it has never before been proposed, so far as we are advised, to store gases in this manner, or thus hold them for considerable periods of time subject to withdrawal as required for consumption or use, nor in any case to withdraw them under regulated or uniform pressure at the point of escape into the main or distributing pipe. In other words, we have turned to useful account, through the aid of further discovery and development, what was previously a mere scientific fact in Physics, and we have thereby produced or developed a safe, practicable, and most valuable mode or method of storing, distributing, and applying to use, a gas which heretofore has been capable of storage and distribution only in vessels of great strength and of relatively small capacity, wherein the entire volume is subject to explosion; or which has required to be generated at the time and place of consumption."

Now against these claims and this explanation, we have the following extracts quoted from text-books, together with the quoted comments of this Board:

The decision says:

"Thus we find it stated in Wurtz's Dictionary of Chemistry, 1875, Vol. 2, page 791 that:

'The amount of gas absorbed by a liquid on which it exerts no

chemical action is dependent (1) on the specific nature of the gas and of the liquid: (2) on the temperature at which the absorption takes place, and (3) on the *pressure* under which the absorption takes place.'

The decision proceeds:

370 "On the pages following this quotation are given the various experimental data by means of which Bunsen verified the law which had been stated as early as 1803 by McHenry in the Philosophical Transactions of the Royal Society of London, No. 1, page 29. This Law is, moreover, well known to those familiar with the art of carbonating liquids. Thus, on page 119 of a 'Treatise on Beverages' Sulz, 1888, we find it stated:

'We have already mentioned that water absorbs a greater amount of carbonic acid with increased pressure. It is found by experiment that this amount increases in proportion to the pressure as follows: at the pressure of one atmosphere (14.7 lb) the water will absorb its own volume; at the pressure of two atmospheres, twice its own volume; at three atmospheres, three times its own volume; and so on, until at about 540 lbs., to the square inch the carbonic acid gas itself becomes a liquid, as was discovered by Faraday in 1823.

The decision continues:

"That the gas so contained in the liquid will escape when the pressure is removed is well known. See for example, page 801 of Vol. 2 of Wurtz's Dictionary above referred to, and page 123, of Sulz's Treatise on Beverages. It is there stated:

'As soon as the pressure in the solution gets diminished by letting escape its surface gaseous contents, a certain amount of the gas *already absorbed by the liquid* is eliminated in consequence of the decreased pressure:'

The decision continues:

"And again on page 421 it is stated that the gaseous contents of a fountain are sometimes entirely lost by the escape of gas, owing to poor connections."

These are the only quotations or citations made by the Board in its former decision, and are, as we understand, the only references relied upon by the Examiner. There is nothing in any of these quotations, nor in anything heretofore published or known, so far as we are aware, or so far as has been developed by the treatment of this or the companion case, to suggest the mode or method of storing and *distributing* gases. The knowledge from and since 1803 of the capacity of liquid solvents of gases to take up a relatively large volume of such gases when the latter were introduced under pressure, coupled with the fact that down to the date of applicants' invention or discovery no one had conceived the possibility of turning this scientific fact to practical account as a means of storing and

371 distributing gases, afford pursuasive evidence that the knowledge had not extended that far; that the application or the further development of this idea was not apparent or obvious.

The fact that other things had to be done, that special adaptation and arrangement of apparatus had to be made in one or another form,—or in other words, that *some form of pressure reducing and*

controlling device must be used between the storage chamber and the point of use, shows that others had stopped short of the discovery or invention here involved, and which renders available and useful in a most important field, the previously useless or unused scientific fact generally and for nearly a hundred years well known.

We submit that the claims as now presented are not met in terms or in substance by the prior art disclosed in this case; that the subject matter of said claims is new and patentable, and covers something more and other than an obvious application of previous knowledge; that the claims set forth legitimate steps or acts to be performed in a stated order. The claims are in our judgment clearly within the definition of art, method, or process as stated in Cochrane v. Deener, 94 U. S. 780, where it is said:

"A process is a mode of treatment of certain materials to produce a given result. It is an act or a series of acts performed upon the subject matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as is a piece of machinery. In the language of the patent law it as an art."

In the present case we begin with a gas. This, by being forced into a solvent, under pressure, produces a solution—a saturated or a supersaturated solution. By venting the holder, the gas held in solution is permitted to separate out from the solvent and to return to its prior gaseous condition. By regulating or controlling the escape opening, and consequently the outflow of gas directly in relation to, and in fact under control of the pressure within the holder, there is maintained a constant and uniform outflow of gas which renders possible the proper and economic utilization, and the perfect combustion, of the gas at the burners or other consuming devices.

To our minds there is a somewhat striking and a very suggestive analogy between the art or method of storing and distributing gas here involved, and the mode of transmitting speech involved in the Bell telephone case. Bell began with sound-waves or vibrations, which, being delivered into or impressed upon the transmitter diaphragm, were in a sense converted into or were caused to set
372 up through vibrations of the diaphragm in front of the poles of the magnet, an undulatory current of electricity. This current conducted by the circuit wire and reaching the predermined destination—acting through a second diaphragm, reproduced the sound vibrations at such point or transformed the undulatory current into sound-waves or vibrations. But these sound waves or vibrations must not only be produced at the distant point, but produced under perfect regulation and control, so as to reproduce in all their minute peculiarities, the original sound vibrations received at the transmitting end of the line.

So here, applicants begin with a gas; they bring it into contact with a solvent, the gas being then under pressure, whereby it is caused to be dissolved in and to form with the liquid a solution of the gas. This solution is transported or conveyed to a distant point for use, and arrived at such point, the gas is restored to its original condition by venting the holder and permitting the gas to separate out of the liquid. Here again, however, such separation must be effected or

permitted under regulation and control, since to permit its free and unlimited escape would be to prevent the proper utilization of the gas, and to cause a waste thereof; hence such escape or separation out of the liquid must be under carefully regulated control. This regulation and control is effected (as fully set forth in the companion application referred to in this) by the automatic reducing valve, whereby the escape opening is proportioned to the pressure of the gas, being smallest when the pressure is greatest, and vice versa. As a consequence the supply at the burner or other point of consumption or use is constant and uniform, as it must be to attain satisfactory results.

Reference having been made in this to the companion case, which more fully shows the special mechanism, we think it would be proper to carry into the present case sufficient description of this mechanism to enable it to be readily understood herein, though of course no claim to such apparatus is proper in this branch of the case.

This invention having past beyond the experimental stage, and being not a mere theory, but an accomplished fact, already commercially introduced abroad, and being or about to be similarly introduced in this country, we submit that the application should be treated in a spirit of liberality, and the claims should be allowed, either in their present form, or in such form as will give substantially the protection which they are designed to give.

Respectfully submitted,

DODGE & SONS,
Associate Att'ys.

373 Washington, D. C., December 11th, 1899.

Endorsed: Appeal No. 22,453. Serial No. 625,581, Paper No. 10. Brief on Appeal. Dated Dec. 11, 1899. Claude and Hess. Second Appeal. Examiners-in-Chief. Dec. 11, 1899. U. S. Patent Office.

No. 22,453.

U. S. PATENT OFFICE, Dec. 16, 1899.

Before the Examiners-in-Chief, on Appeal.

Application of Georges M. A. Claude and Georges A. Hess for a Patent for an Improvement in a Method of Storing Acetylene Gas for Distribution, filed March 1, 1897, Serial No. 625,581. Second Appeal.

Mr. Jos. P. Livermore and Messrs. Dodge & Sons, Assocs., Attorneys for Appellants.

The claims appealed are:

"1. The herein described method of storing and delivering gas which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in

the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which is directly controlled by and proportionate to the pressure of the gas within the holder.

"2. The herein described method of storing and distributing gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a close chamber and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure in quantity directly proportionate to the rate of consumption or use.

"3. The method of storing and distributing acetylene which consists in forcing the same under pressure, into a liquid solvent of acetylene, in a close vessel; sealing said vessel; transporting the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally opening communication between the vessel and the main and permitting the gas to flow from the vessel to the burners under its own pressure at a uniform rate."

The references are:

374 Treatise on Chemistry, Roscoe & Schorlemer, N. Y., 1890, Vol. 3, part 2, p. 454, paragraph 783;

Wurtz's Dictionnaire du Chemie Pure et Applique Tome 1, partie p. 43, Acetylene, Solubilite de' l'Acetylene;

Journal of the Franklin Institute, May, 1895, Philadelphia, p. 326, lines 14-20;

Wurtz's Dictionary of Chemistry, Vol. 2, page 791 and Vol. 2, page 801;

Extracts from a Treatise on Beverages, Sulz, 1888, pp. 119, 123, and 421.

It is admitted by the applicant in his brief that:

"When such a solvent is charged with the gas under pressure, a supersaturated solution is produced, and as above indicated, the broad idea of making a supersaturated solution of different gases with their solvents is a well established scientific possibility of fact.

It may also be admitted that in the case of such supersaturated solution, the gas above or beyond the quantity required to effect such saturation, will, if the upper portion of the vessel be vented, separate out of the solvent, and escape or flow off."

His present invention consists in releasing such gas through a pressure regulator. No such device is shown or described in the present application, though cross reference is made to another application by this applicant, in which such regulator is described.

If there were any novelty in using a pressure regulator to permit a gas under pressure to flow at a uniform rate to its place of use, these claims might have some standing. But such devices are common in arts, so common that one whole class of patents is devoted to them (see Div. III, Class 50, Fluid-Pressure Regulators). These pressure regulating devices are used wherever gases under higher pressure than is desired are to be distributed or used under lower uniform pressure.

The use of this old apparatus to perform its usual function in con-

nection with an old method of compressing gas into a solution is not a new invention, but a mere application of the expected knowledge of any one familiar with the art of gas distribution.

The decision of the Examiner is affirmed.

J. H. BRICKENSTEIN,
S. W. SHOKING,
T. C. STEWARD,
Examiners-in-Chief.

375 Indorsed: Appeal No. 22,453. Serial No. 625,581, Paper No. 11. Decision. Dated Dec. 16, 1899. Claude & Hess. Second Appeal. Recorded, Vol. 67, p. 270. Examiners-in-Chief. Dec. 16, 1899. U. S. Patent Office.

1899.

Contents.

1. Reasons of appeal, May 9, 1899.
2. Examiner's statement, " "
3. Hearing, Wednesday June 7, '99—2.30 P. M.
4. Brief on appeal, June 7, '99.
5. Decision (copy to att'y), June 19, '99.
6. Second appeal.
7. Reasons of appeal, Nov. 23, 1899.
8. Examiner's statement, " 27, 1899.
9. Hearing, Monday Dec. 11, '99—1.30 P. M.
10. Brief on appeal, Dec. 11, '99.
11. Decision (copy to att'ys), Dec. 16, '99.
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Endorsed: U. S. Patent Office. Copy made Feb. 8, 1911. 17,859/11. M. A. J. M. C. W.

(DEFENDANTS' EXHIBIT No. 11.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents of the Appeal to the Commissioner filed April 21, 1900, in the matter of the
376 Application of G. M. A. Claude and G. A. Hess, Filed March 1, 1897, Serial Number 625,581, for Improvement in Method of Storing Acetylene Gas for Distribution;

No appeal from the Decision of the Commissioner to the Court of Appeals having been taken within the limit of Appeal.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 9th day of February, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Assistant Commissioner of Patents.

1900.

625,581.

Appeal to the Commissioner of Patents.

No. 225.

Georges M. A. Claude and Georges A. Hess,
Of ——,
County of ——,
State of ——.
Method of Storing Acetylene Gas for Distribution.
Rec'd Apr. 21, 1900.
Petition, " " "
Cash, $20, Apr. 21, 1900.
Cert. Dep. ——.
Circular ——.
2. —.
3. —.
Dodge & Sons, City.

Amount Received, $20. Chief Clerk.

United States Patent Office.

To the Commissioner of Patents.

SIR: We hereby appeal to the Commissioner in person from the decision of the Examiners-in-Chief, in the matter of our ap-
377 plication for improvement in the Method of Storing Acetylene Gas for Distribution, filed March 1st, 1897, Serial No. 625,581. The following are assigned as reasons of appeal:

1. That the invention set forth and claimed is not met or answered by the citations upon which it is rejected.

2. That the claims are not for the mere double use of apparatus previously existing, but are for a new and exceedingly valuable method of accomplishing what has hitherto been accomplished only with great difficulty and subject to danger and large expense.

It is desired to present the case orally.

Respectfully,

GEORGES M. A. CLAUDE,
GEORGES A. HESS,
By DODGE & SONS,
Associate Att'ys.

Washington, D. C., April 20th, 1900.

Indorsed: U. S. Patent Office, Apr. 21, 1900. Chief Clerk. Serial No. 625,581, Paper 1. Reasons of Appeal. Filed Ap'l 21, 1900. Claude & Hess.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
B. W. M. WASHINGTON, D. C., April 24th, 1900.

In the Matter of the Application of Claude & Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1, 1897. Ser. No. 625,581.

On Appeal to the Commissioner.

SIR: You are hereby informed that a hearing on the above appeal from the decision of the Examiners-in-Chief has been fixed for Tuesday May 8th, 1900 at 11 A. M. You are also informed that no postponement will be granted without good and sufficient reasons therefor.

By direction of the Commissioner.

Very respectfully,

E. V. SHEPARD,
Chief Clerk.

378 Claude & Hess, c/o Dodge & Sons, Washington, D. C.

Indorsed Serial No. 625,581, Paper No. 3. Notice of hearing. Dated Ap'l 24, 1900. Claude & Hess.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
B. W. M. WASHINGTON, D. C., May 1st, 1900.

In the Matter of the Application of Claude & Hess. Method of Storing Acetylene Gas for Distribution. Filed March 1, 1897. Ser. No. 625,581.

On Appeal to the Commissioner.

SIR: You are hereby informed that a hearing on the above appeal has been continued to Friday, May 11th, 1900 at 11 A. M.

By direction of the Commissioner.

Very respectfully,

E. V. SHEPARD,
Chief Clerk.

F.

Claude & Hess, c/o Dodge & Sons, Washington, D. C.

Indorsed: Serial No. 625,581, Paper No. 6. Notice of postponement. Dated May 1st, 1900. Claude & Hess.

United States Patent Office.

Before the Commissioner of Patents.

In the Matter of the Appeal of G. M. A. Claude & G. A. Hess. Method of *of* Storing Acetylene Gas for Distribution.

This case may be conveniently considered in connection with the brief submitted in the companion case, No. 625,580, covering the apparatus preferably employed in carrying out this method. In said brief the substance of the argument upon which we rely herein is set forth, and hence will not be repeated in this.

379 It is proper to say, however, that in our judgment, the illustration contained in the apparatus case, or a portion thereof, should be reproduced in this, since the reducing valve, or some equivalent thereof, is contemplated in the claims in this. The fact that the applications were concurrently filed with proper cross reference seems to make it entirely proper to make such further illustration in the case.

Without repeating the description of the method or of the apparatus, but passing directly to the claims appealed, and to the decision thereon, we have to say that each and all recite a series of steps whereby a substance or agent (a gas) is converted or changed to another form, to-wit, a solution, and thereby adapted for storage and transportation, and whereby the gas is subsequently restored to its original condition, and safely and conveniently delivered at the points of consumption. This makes it a legitimate process within the definition of a method or process as laid down by the Supreme

Court of the United States,—notably in Cochran vs. Deener, 94 U. S., 780, wherein it was said:

"A process is a mode of treatment of certain materials to produce a given result. It is an act or a series of acts performed upon the subject matter to be transformed and reduced to a different state or thing. If new and useful, it is just as patentable as a piece of machinery. In the language of the patent law it is an art."

The vital distinction between what applicants' claims call for and what was previously known is well set forth in the following statement introduced into the specification in advance of the claims after discovery by the Board of Appeals of the fact that text-books showed that it was not broadly new to produce a supersaturated solution of gas by forcing the gas under pressure into a solvent. The statement in the specification is as follows:

"Though it has long been known that various gases are soluble in one or another liquid, and that the quantity of gas dissolved in or by a given liquid varies in proportion to the pressure under which the gas is introduced, we have made new or additional discoveries showing that gas *is* so dissolved and held by a liquid solvent can be drawn off at relatively low but uniform pressure, as required for its proper consumption; and that although the relatively small quantity of free gas in the receptacle above the solvent may be ignited, the gas still in solution is not affected.

While for experimental purposes and to determine the properties of gases and of their solvents, various gases have been forced under pressure into solvents, it has never before been proposed, so
380 far as we are advised, to store gases in this manner, or to thus hold them for considerable periods of time subject to withdrawal as required for consumption or use, nor in any case to withdraw them under regulated or uniform pressure at the point of escape into the main or distributing pipe. In other words, we have turned to useful account, through the aid of further discovery and development, what was previously a mere scientific fact in Physics, and we have thereby produced or developed a safe, practicable, and most valuable mode or method of storing, distributing, and applying to use, a gas which heretofore has been capable of storage and distribution only in vessels of great strength and of relatively small capacity, wherein the entire volume is subject to explosion; or which has required to be generated at the time and place of consumption."

This statement fully and entirely covers all that has been set forth in the text-books cited in rejection of these claims. The knowledge contained in them it now appears has been the public property of all the world from 1803 to date, and yet with the pressing need of a safe, convenient, and economical method of storing and distributing acetylene gas, no one prior to applicant's accomplishment of that result, knew or realized the possibility of utilizing this scientific knowledge to such end.

It is clear that the most that was done prior to their discovery, which went considerably beyond the matters disclosed in the previous publication, was to test solvents to ascertain their capacity as

such, or to test the properties and qualities of different gases as to solubility.

There is not a word to indicate that any use was ever made of gas so stored, that it was ever kept in storage or retained for any time after determining these two properties, or that it was realized that it could be in any manner utilized. Apparently the test was made and then the gas permitted to escape, or the whole solution thrown away. At all events there is nothing to indicate anything further in the way of its utilization. It remained for applicants to discover as they have discovered, the entire safety of the method in that the gas so long as it remains in solution cannot be ignited, nor caused to explode. Only such of the gas as is liberated and ceases to constitute a part of the solution, can be lighted. This is more fully set forth in the companion brief.

Replying to the suggestion or query of Your Honor at the recent hearing, as to claims possibly falling within the decision of the Court in the Medart pulley case, we beg to say that here, as it seems to us, a force of nature is directly involved, and there is a change,—a chemical change involved in the dissolution of the gas and its
381 combination with the solvent, producing something different from the solvent alone or the gas alone; and there is a second change of this sort in the reconversion. However this may be, the Medart decision has been, as Your Honor is of course well aware, very effectually discounted by the Supreme Court of the United States in an opinion announced by Justice Brown, the author of the Medart decision, vide, Boyden Power Brake Co., et al. v. Westinghouse et al., 83 O. G., 1067-1072.

The force of this later decision and its legitimate bearing upon the practice of the Office has been fully recognized by the present Commissioner, Mr. Duell in ex parte Rogers & Winslow, 87 O. G., page 699, decided April 10, 1899, in which the whole subject is quite fully discussed.

We request that the decision of the Examiners-in-Chief be reversed, and that the patent [to] accordingly granted.

Respectfully,

DODGE & SONS,
Associate Att'ys.

Washington, D. C., May 16th, 1900.

Indorsed: Assistant Commissioner, May 17, 1900. U. S. Patent Office.

May 11, 1900. S. E. T.

United States Patent Office.

Ex Parte G. M. A. CLAUDE and G. A. HESS.

Method of Storing Acetylene Gas for Distribution.

Appeal from Examiners-in-Chief.

Application filed March 1, 1897, No. 625,581.
Mr. Jos. P. Livermore and Messrs. Dodge and Sons for appellant.

This is an appeal from the decision of the examiners-in-chief affirming the rejection by the primary examiner of the following claims:

"1. The herein described method of storing and delivering gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which if directly controlled by and proportionate to the pressure of the gas within the holder.

382 "2. The herein described method of storing and distributing gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a close chamber, and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure in quantity directly proportionate to the rate of consumption or use.

"3. The method of storing and distributing acetylene, which consists in forcing the same under pressure, into a liquid solvent of acetylene, in a close vessel; sealing said vessel; transporting the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally opening communication between the vessel and the main and permitting the gas to flow from the vessel to the burners under its own pressure at a uniform rate."

The references are:

Treatise on Chemistry, Roscoe & Schorlemer, N. Y., 1890, Vol. 3, part 2, page 454, paragraph 783;

Wurtz's Dictionnaire de Chimie, Pure et Appliquee, Tome 1, partie 1, page 43, Acetylene, Solubilite de l'Acetylene;

Journal of the Franklin Institute, May, 1895, Philadelphia, page 326, lines 14-20;

Wurtz's Dictionary of Chemistry, Vol. 2, page 791, and Vol. 2, page 801;

Extracts from a Treatise on Beverages, Sulz, 1888, pages 119, 123, and 421.

It was common long prior to the appellants' invention to force under pressure into a liquid solvent thereof in a closed vessel and was

also common to draw off gas from a holder where it was contained under pressure through an opening, the effective size of which was directly controlled by and proportionate to the pressure of the gas within the holder, or, in other words, through a pressure regulator. The appellants were therefore not the inventors of the step of storing gas, as set forth, nor of the step of permitting gas to escape from a place of storage in the manner set forth. Neither of these steps modifies in any manner the old and expected effect of the other and the final result of the alleged process, namely, distributing gas at a uniform pressure, is the same as that produced by processes old in the art, as above stated. The appellants have therefore not invented a new and patentable process, although as held in a companion case, they have devised an apparatus by which the old process of storing gas can be made practically and commercially useful. Claims
383 to that apparatus have been allowed and it is believed that it is the only patentable invention disclosed by them.

The claims in the present case as filed covered merely the step of storing gas by forcing it under pressure into a solvent thereof in a closed vessel and there was no limitation in the specification or drawing that the appellants intended to use a pressure regulator to control the escape of the gas. This limitation which is included as an element of the present claims, was first inserted by amendment, but the examiners-in-chief intimate that a cross reference in the specification to another application in which a pressure regulator was disclosed furnished sufficient basis for the introduction in this case of the limitation. I cannot agree with this holding, however, since it is clear that in the present case as filed a pressure regulator was not regarded as a part of the invention. The cross reference merely states that the other case shows "an apparatus adapted to be used in conjunction with the method of storing acetylene for distribution herein described" and does not purport to make the disclosure in that case a part of the disclosure in this. On the contrary, the present case includes a drawing disclosing a complete apparatus and no pressure regulator is shown therein. Even if the claims were not held to be unpatentable for the reasons given by the lower tribunals, they could not be allowed for the reason that they involve new matter.

It appears, further, that they do not cover proper methods, but merely the functions of mechanism and that they are not patentable in view of the decisions in Cochrane v. Deener, 94 U. S., 780, and Boyden Brake Co. v. Westinghouse, 83 O. G., 1067. Claim 3 clearly covers several independent [*independent*] disconnected steps which do not go to make up a patentable process.

The decision of the examiners-in-chief is affirmed.

WALTER H. CHAMBERLIN,
Acting Commissioner.

May 26, 1900.

Indorsed: Serial No. 625,581 Paper No. 7 Comm'r's Decision. Dated May 26, 1900; Recorded Vol. 69 Page 318.

B. W. M.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., May 28th, 1900.

In the Matter of the Application of Claude & Hess. Method of Storing Acetylene. On Appeal to the Commissioner. Gas
384 for Distribution. Filed March 1st, 1897. Ser. No. 625,-581.

SIR: You are hereby informed that the decision of the Examiners-in-Chief has been affirmed by the Acting Commissioner.

Please find enclosed herewith a copy of the decision.

By direction of the Commissioner,

Very respectfully,

E. V. SHEPARD,
Chief Clerk.

Claude and Hess, C/o Dodge and Sons, Washington, D. C.

Indorsed: Serial No. 625,581. Paper No. 8. Notice of Comm's Decision. Dated May 29, 1900. Claude & Hess.

1900.

Contents.

Application, — Papers.
1. Reasons of appeal Apl. 21, 1900.
2. Hearing May 8 "
3. Notice of " Apr. 24 "
4. Request for postponement Apr. 30/1900.
5. See case 625,580.
6. Notice of postponement May 1st "
7. Comm'r's decision " 26 "
8. Notice of " " 28,
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Title: Improvement in —.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

Patent Office copy made Feb. 8, 1911.

385 (DEFENDANTS' EXHIBIT No. 12.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of an Extract from Page 791 of a Publication, in the Library of this Office, entitled:

A Dictionary of Chemistry.
By Henry Watts, B. A., F. R. S., F. C. S.

In Five Volumes.

Volume II,
Conhydrine-Gytge.

New Edition.
London:
1875.

Said Volume received in the Library June 30, 1881.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 14th day of April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Extract from Page 791.

The amount of a gas absorbed by a liquid upon which it exerts no direct chemical action, is dependent: (1.) in the specific nature of the gas and of the liquid; (2). on the temperature at which the absorption takes place; (3). on the pressure under which the absorption takes place.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

U. S. Patent Office. Copy made Apr. 13 1911.

386 (DEFENDANT'S EXHIBIT No. 13.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of an Extract from pages 43 and 44 of a Publication, in the Library of this Office, entitled:

Dictionnaire De Chimie.
Pure et Appliquée.
Par Ad. Wurtz.

Tome Premier,
Première Partie,
A-B.

Paris.

Said Volume received in the Library October 17, 1891.

Attached, hereto, is a true copy of a Translation of said Extract, made by the Official Translator.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 4th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Extract from Page 43.

Solubilité de l'acétylène.—L'eau, le sulfure de carbone, l'hydrure d'amyle dissolvent environ leur volume de gaz acétylène; le pétrole d'éléclairage 1½ volume, l'essence de térébenthine et le perchlorure de carbone 2 volumes; le chloroforme, ala benzine, 4 volumes; l'acide acétique cristallisable et l'alcool absolu près de 6 volumes (Berthelot, Ann. de Chim. et de Phys., (4), t. IX, p. 424).

Acton de la chaleur.—L'acétylène chauffe dans une cloche courbe, jusqu'au ramollissement du verre, pendant une demiheure,
387 est décomposé: La majeure partie de ce carbure est transformée en produits liquides et fixes, qui paraissent contenir principalement du styrol, du métastyrol, des traces de naphtaline et un peu de charbon. Quant aux produits gazeux, ils renferment un peu d'hydrogène, d'éthylene, d'hydrure d'ethyle et d'acétylène non décomposé (Berthelot, Compt. rend., t. LXII, p. 905).

L' action que la chaleur exerce sur l'acétylène diffère dans ses résultate, lorsqu'elle a lieu en présence de corps divers: Ainsi, en présence du charbon (coke éteint dans le mercure) l'acétylène se résout en ses éléments, l'hydrogène se dégage et le carbone se dépose.

En présence de l'azote ou de l'oxyde de carbone, l'acétylène eprouve des transformations analogues, mais ne donne pas de produits particuliers.

L'hydrogène retarde la transformation de l'acétylène; les produits sont les mêmes, sauf une plus grande production d'éthylène: l'hydrogène, dans cette expérience, semblerait as combiner directement avec l'acétylène:

$$C^2 H^2 + H^2 = C^2 H.$$

L'action la plus remarquable de la chaleur sur l'acétylenè est celle qu'elle exerce sur cet hydrogène carboné en présence d'hydrocar-

bures non saturés. M. Berthelot chauffe des volumes égaux d'acetylène et d'éthylène, à la température du remollissement due verre; au bout d'une demi-heure environ les 2 tiers du mélange ont disparu, et parmi les produits divers qui se forment, le principal est un liquide très-volatil, facilement absorbable par le brome, par l'acide sulfurique monohydraté, peu soluble dans la solution ammoniacale de protochlorure de cuivre et répondant à la formule $C^4 H^6$; c'est le crotonylène ou son isomère (Compt. rend. de l'Inst., t. 497).

Dans cette expérience, l'acétylène et l'éthylène se sont combinés a volumes égaux avec une condensation de moitié.

$C^2 H^2$ (2 volumes) + $C^2 H^4$ (2 volumes) = $C^4 H^6$ (2 volumes).

Chauffé dans les mêmes conditions avec un excès de benzine, l'acétylène est promptement absorbé, il reste à peine le cinquième du volume gazeux primitif, et par l'évaporation spontanée de la benzine on obtient un carbure cristallisé, distinct de tous les carbures connus.

La naphtaline absorbe aussi l'acétylène, mais plus promtement que la benzine. Le résidu gazeux dans ces deux réactions est formé d'hydrogène mélangé d'un peu de gaz éthylène et d'hydrure d'éthyle.

388 Translation.

From Wurtz, "Dictionnaire de Chimie pure et appliquee", Vol. I, part 1.—Extract, p. 43.

Solubility of acetylene.—Water, carbon disulphide and amyl hydrid dissolve about their volume of acetylene gas; illuminating petroleum, 1½ times its volume; essence of turpentine and carbon perchloride, twice their volume; chloroform and benzine, 4 times their volume; crystallisable acetic acid and absolute alcohol, about 6 times their volume. (Berthelot, Ann. de Chim. et de phys., (4), Vol. IX, p. 424.)

Action of heat.—Acetylene heated in a glass bell, until the glass softens, for half an hour, is decomposed; the greater part of the carbide is transformed into liquid and fixed products, which appear to contain chiefly styrol, metastyrol, traces of naphthalene and a small amount of carbon. The gaseous products contain a small amount of hydrogen, ethylene, ethyl hydrid, and non-decomposed acetylene. (Berthelot, Compt. rend., Vol. LXII, p. 905).

The action which heat exerts on acetylene differs in its results when it takes place in presence of various bodies. Thus, in presence of carbon (coke extinguished in mercury), acetylene separates into its elements, hydrogen being evolved and carbon precipitated.

In presence of nitrogen or of carbon monoxide, acetylene undergoes, analogous transformations, but does not give special products.

Hydrogen retards the transformation of acetylene. The products are the same except that more ethylene is produced; the hydrogen in this experiment would seem to combine directly with the acetylene;

$$C^2 H^2 + H^2 = C^2 H^4.$$

The most remarkable action of heat on acetylene is that which it exerts on this hydrocarbon in pressence of non-saturated hydrocar-

(Dict. de Chim., I, 1.)

bides. Mr. Berthelot heats equal volumes of acetylene and ethylene at the temperature which softens glass; at the end of half an hour about two-thirds of the mixture has disappeared, and among the different products formed the principal one is a very volatile fluid, susceptible of being easily absorbed by brome and by monohydrated sulfuric acid, sparingly soluble in an ammoniacal solution of cuprous chloride, and corresponding to the formula $C^4 H^6$; this is crotonylene or its isomere. (Compt. rend. de l'Inst., vol. LXII, p. 947.)

389 In this experiment the acetylene and ethylene combine in equal volumes, the condensation being one-half.

$C^2 H^2$ (2 volumes) + $C^2 H^4$ (2 volumes) = $C^4 H^6$ (2 volumes). Heated under the same conditions with an excess of benzine, the acetylene is promptly absorbed; there remains scarcely one-fifth of the original volume of the gas, and by spontaneous evaporation of the benzine we obtain a crystallized carbide which is different from any known carbide.

Naphthalene also absorbs acetylene, but more promptly than benzine. The gaseous residue in these two reactions is formed of hydrogen mixed with a small amount of ethylene gas and ethyl hydrid.

N. E. K.
2-17-11.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

U. S. Patent Office. Copy made Mar. 1, 1911.

(DEFENDANTS' EXHIBIT No. 14.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To All to Whom These Presents Shall Come, Greeting:

This is to Certify that the annexed is a true copy of an Extract from page- 119 and 120; also page 421 of a publication in the Library of this Office entitled:

"A Treatise on Beverages
or
The Complete Practical Bottler."
by
Charles Herman Sulz,
New York:
1888.

Said Publication received in the Library July 7, 1891.
In Witness whereof I have hereunto set my hand and caused the

Seal of the Patent Office to be affixed at the City of Washington, this 4th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independance of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

390 Page 119:

7. Chalk, marble, limestone, Iceland spar, oyster shell, pearlash, carbonate of soda, etc., all yield carbonic acid gas when treated with a stronger acid, as sulphuric, muriatic, etc.

The second of these sources of carbonic acid is largely employed in London in the manufacture of ærated bread, and is found to answer admirably. (Carbonating machinery to be used in the manufacture of ærated—properly named carbonated—bread, is also introduced in the United States. The carbonic acid gas is forced through the dough at a pressure of 100 pounds. This does away with the use of yeast.) The gas, which lies in a thick layer on the surface of the vats, is pumped by a suitable pump into a large india-rubber bag, and carried to the factory. It is probable, however, that this system would not suit at all for carbonated waters, for the fumes of the fermentation, which are an advantage to the taste of the bread, would probably give an unpleasant effect in carbonated waters.

The sixth source has been employed in France in the manufacture of carbonated waters, but it involves great outlay in plant for the purification of the gas, and is not recommended.

The means of production last named is that which is universally used in various forms for making carbonated waters.

Even in the simple form of seidlitz powders (which we must recognize as producing carbonated waters), the effervescence results from the action of the acid in the one paper, on the carbonate of soda, etc., in the other.

In seltzogenes, carbonators, etc., the gas and the pressure are produced in the same way by a similar mixture.

In the manufacture of carbonated waters on a large scale, the gas is usually produced by placing chalk, in the form of whiting, or powdered marble, or some other form of pure limestone, mixed with water, in a closed leaden or wooden vessel, and then introducing gradually sufficient sulphuric acid to disengage all the carbonic acid, and convert the residue into a neutral salt—sulphate of lime. The chemical combination which goes on in freeing the gas, produces a considerable amount of heat, and as increased heat is unfavorable to the combination of the gas with water it is desirable that the gas should be cooled before being used.

Occasionally muriatic acid is employed, but it is not so much to be recommended, as it throws off a great amount of vapor, which may easily pass over with the carbonic acid, and be difficult to separate. The former system is also cheaper, and has no practical drawbacks whatever. The spent whiting, or marble dust,
391 is a harmless compound, and can be easily removed and disposed of.

Its Absorption by Water. We have already mentioned that water absorbs a greater amount of carbonic acid with increased pressure. It is found by experiment that this amount increases in proportion to the pressure, as follows: At the pressure of one atmosphere (14.7 lbs.) the water will absorb its own volume; at the pressure of two atmospheres, twice its own volume; at three atmospheres, three times its own volume, and soon, until at about 540 lbs. to the square inch, the carbonic acid gas itself becomes a liquid, as was discovered by Faraday in 1823.

Extract from Page 421.

Relining Portable Fountains. To ascertain if a fountain needs relining, empty it of carbonic acid gas by tipping it upside down, then wash out thoroughly, lower a lighted candle into the fountain by a wire, and it can be readily seen whether the lining is worn off or not. A fountain well lined and properly taken care of will last for soda water about five years. It is important that -his work should never be entrusted to other hands than those of a regular manufacturer of soda-water apparatus. Coppersmiths used to other kinds of work cannot appreciate nor understand the great strength required in a soda-water fountain, which is at times subjected to a higher pressure than is required even in a steam-engine boiler.

As a fountain has to be taken apart for repairs and relining, it would be extremely hazardous to rely upon its being safely put together by a coppersmith who is not also a regular manufacturer of soda-water apparatus.

Escape of Gas from Fountains. Complaints are frequent that the pressure is lost from a fountain before its contents are drawn off. This is always caused either by the use of a poor washer between the cock and the top of the fountain, or by a failure to use the spanner wrench with sufficient force to make a tight joint. The gas may all escape without being manifested by appearance, in sight or sound. It cannot escape from the cock, for it would then drive the water before it and the leak would be apparent. Thick, soft, oil-tanned leather, such as harness makers use, should be used, and not the ordinary sole leather.

Sometimes shaking of the fountain may help, as carbonic acid separates from the water and increases the pressure on the latter. In case this manipulation is not sufficient, the pressure in fountain is too low and the fountain must be recharged and the leakage made tight.

392 The Dispensing Apparatus. Various are the devices intended for dispensing carbonated beverages directly from the fountains, and sometimes very costly and highly ornamental apparatus are put up in very attractive style, selected to gain the favor of the customers.

The internal or working parts of all the various apparatus are in the main point the same, and a glass of good soda water should be drawn from the plainest apparatus as well as from the most elaborate one.

With that more or less ornamental external marble shell the dispenser is familiar, and it remains for us to explain the details of the interior.

White marble is looked upon with disfavor by experienced dispensers. Although the imported Italian is the finest and most beautiful white marble and considerably cheaper than the colored varieties, it is not desirable from the fact that it becomes stained and loses its clean appearance. Where a cheap apparatus is desired the cheaper varieties of foreign and domestic marble, white and colored, are recommended.

The marble must be sound and strong and in appearance lustrous with polish; the metal parts must be heavily plated.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

U. S. Patent Office. Copy Made Mar. 13, 1911.

(DEFENDANTS' EXHIBIT No. 15.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of an Extract from page 123 of a Publication, in the Library of this Office, entitled:

A Treatise
on
Beverages
or
The Complete Practical Bottler.
By
Charles Herman Sulz,
New York:
1888.

393 Said Publication received in the Library July 7, 1891.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 13th day of April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Extract from Page 123.

As soon as the pressure in the cylinder gets diminished by letting escape its surface gaseous contents, a certain amount of the gas already absorbed by the liquid is eliminated in consequence of the decreased pressure, and supports the displacement of that combined

gaseous contents above its surface, viz., atmospheric air and uncombined gas.

U. S. Patent Office. Copy made Apr. 12, 1911.

(DEFENDANTS' EXHIBIT No. 16.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of certain Extracts beginning on Pages 135 and 441 of a Publication in the Library of this Office entitled:

A Treatise on Chemistry.
By H. E. Roscoe, F. R. S., and C. Schorlemmer, F. R. S.
Volume I.
The Non-metallic Elements.
New York.
1891.

Also tracings of the illustrations embodied in said extracts.

Said volume received in the Library December 5, 1892.

394 In testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 4th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

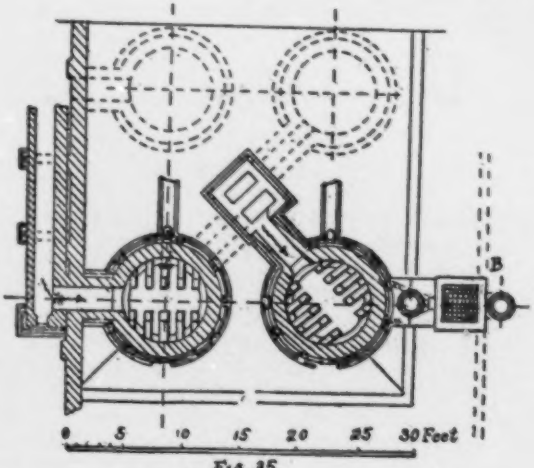


Fig. 35.

Extract from Page 135.

57. Manufacture of Hydrochloric Acid. This acid is obtained on the large scale as a bye-product in the manufacture of soda-ash. In the alkali works 10 cwt. of salt is introduced into a large hemispherical iron pan, 9 feet in diameter, heated by a fireplace underneath, and covered by a brickwork dome; upon this mass of salt the requisite quantity (10 cwt.) of sulphuric acid (sp. gr. 1.7) is allowed to run from a leaden cistern placed above the decomposing pan. Torrents of hydrochloric acid gas are evolved, which collect in the space between the pan and the brickwork dome, whence they pass by a brickwork or earthenware flue into upright towers or condensers, built of bricks soaked in tar, or of Yorkshire flags fitted and clamped together. These towers, shown in vertical section in Fig. 34, and in ground plan in Fig. 35, are, filled with bricks or coke, down which a small stream of water from a reservoir at the
395 top of the tower, is allowed to trickle. The gas, passing upwards, as shown in figures by the arrow, meets the water and is dissolved by it; and as the acid-liquor approaches the bottom of the tower it becomes more and more nearly saturated with the gas.

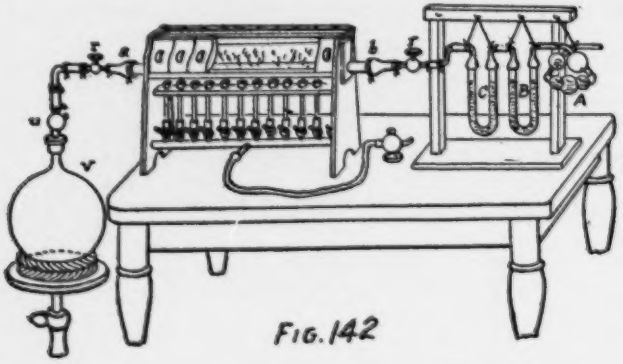


FIG. 142

Extract from Page 441.

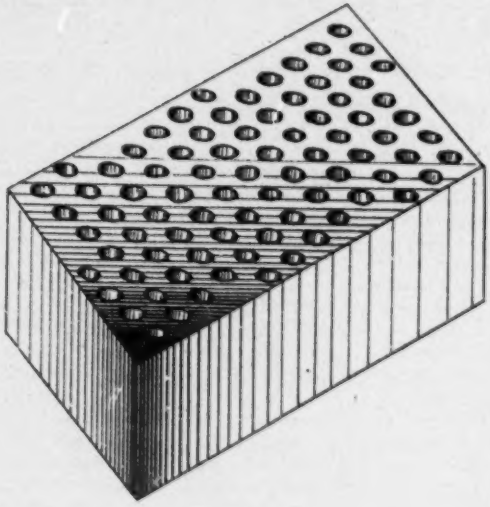
258. Two processes are now used, viz: (1) measurement of the volumes of the component gases, (2) determination of their weight. The first of these processes, or the eudiometric method, has been practiced by Regnault, Bunsen Lewy, and Angus Smith, whilst the latter method has chiefly been used by Dumas and Boussingault in their celebrated research carried out in the year 1841. In their analysis of air by the latter method, the two French chemists employed an apparatus shown in Fig. 142. The large balloon (V) was rendered as perfectly vacuous as possible, and brought in connection with the vacuous tube (*a b*), containing metallic copper reduced by means of hydrogen, and placed in a furnace in which it

397

A. STEARNS.

Manufacture of Carbonates and Bicarbonates.

No. 224,240. Patented Feb. 3, 1880.



Witnesses:
Chandler Hall
J. J. Keane

Inventor.
Albert Stearns
by his Attorneys
Baxter & Burns

UNITED STATES PATENT OFFICE.

ALBERT STEARNS, OF BROOKLYN, NEW YORK.

MANUFACTURE OF CARBONATES AND BICARBONATES.

SPECIFICATION forming part of Letters Patent No. 224,940, dated February 3, 1880.

Application filed October 7, 1879.

To all whom it may concern:

Be it known that I, ALBERT STEARNS, of Brooklyn, in Kings county and State of New York, have invented certain new and useful Improvements in the Process of Charging Substances with Gases, of which the following is a specification.

This invention is more especially intended to be used in the manufacture of bicarbonate of soda, but may be employed for the charging of various chemical substances with carbonic-acid or other gas.

A common method of charging carbonate of soda with carbonic-acid gas for its conversion into bicarbonate is to treat it in shallow trays provided with cloth bottoms, through which the gases may pass, and placing the said trays, after filling them, in a closed chamber, where their contents are subjected to the action of gas.

The object of this invention is to prepare the carbonate of soda or other substance to be treated so that when subjected to the action of the gas it is exposed on all sides, so as to permit its mass to be thoroughly penetrated thereby, and exposing a large amount of surface without danger of discoloration from contact with wood or cloth, as in methods now commonly in use, and also effecting a saving of time.

The accompanying drawing represents a perspective view of a block of material to be charged with gas.

To this end my invention consists in first molding the substances into self-sustaining perforated blocks, subsequently removing them from the molds, and then subjecting them to the action of gas in a closed chamber, in which they are exposed on all sides to the action of gas. By reason of the perforations in the blocks a large extent of surface is presented for the gas to act on, and these blocks may be very conveniently molded by means of the apparatus forming the subject of my application for Letters Patent filed June 14, 1879.

The carbonate of soda or other substance which it is desired to charge with gas, and which, in the case of carbonate of soda, is prepared in the form of a plastic, or approximately plastic, compound, is molded into blocks of any size and shape desired. When dried these blocks are self-sustaining, and may be handled and moved from place to place without losing their block-like form.

In order to increase the exposed surface of the block upon which the gas may act the block is filled with perforations extending partly or entirely through it. These perforations are preferably made when the block is molded, and the apparatus forming the subject-matter of my aforesaid application may be conveniently used for this purpose. With some materials, however, which require a long time to harden or set, the perforations might be made after the blocks were molded. The blocks so prepared are then placed in a charging-chamber, which is afterward filled with gas and supported upon slats or bars separate from each other, so that the gas may circulate all around and through them, thereby penetrating all portions of the block and charging it uniformly throughout in a very short space of time.

In charging some substances which require a considerable time to harden or set, the substance may first be placed in the charging-chamber in pans, and the process of charging with gas commenced and continued until the substance has attained a sufficient hardness to retain its block-like or molded form; but in all cases it is intended to remove the substance from the pans as soon as it will retain its block-like form, and the operation of charging with gas is nearly or wholly performed while the substances are in the form of blocks and exposed on all sides to the action of gas.

I am aware that artificial building-blocks, &c., have been subjected to the action of carbonic-acid gas in closed chambers, and such I therefore disclaim.

What I claim as my invention, and desire to secure by Letters Patent, is—

An improvement in the process of charging chemical substances with gas, consisting in first molding said substances into self-sustaining perforated blocks, subsequently removing such blocks from the molds, and then subjecting them to the action of gas in a closed chamber, in which they are exposed on all sides to the action of gas, substantially as specified.

ALBERT STEARNS.

Witnesses:
T. J. KEANE,
FREDK. HAYNES.

could be heated to redness by means of charcoal or gas. At the other end this tube was connected with the tubes C and B, and with the bulbs A, these last contained caustic potash, and the others pumice-stone moistened with strong sulphuric acid for the purpose of taking up all moisture from the air, as well as of abstracting from it the whole of its ammonia and carbon dioxide. As soon as the tube *a b* had been heated to dull redness the stopcocks *r* were opened so as to let the air pass slowly into the apparatus. Entering the tube *a b*, and coming in contact with the glowing copper, the whole
396 of the oxygen was absorbed, only the nitrogen going over into the vacuous globe.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 17.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Albert Stearns, Number 224,-240, Granted February 3, 1880, for Improvement in the Manufacture of Carbonates and Bicarbonates.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 15th day of February, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Commissioner of Patents.

(Here follow drawing, marked page 397, and lithograph, marked page 398.)

399 No. 234,240.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Albert Stearns, of Brooklyn, New York, has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in the Manufacture of Carbonates and Bicarbonates, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of law in such case made and provided; and

Whereas, upon due examination made, the said claimant is adjudged to be justly entitled to a patent under the law;

Now, therefore, these Letters Patent are to grant unto the said Albert Stearns, his heirs or assigns, for the term of seventeen years from the third day of February one thousand eight hundred and eighty the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof, I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this third day of February in the year of our Lord one thousand eight hundred and eighty and of the Independence of the United States of America the one hundred and fourth.

[SEAL.]

A. BELL,
Acting Secretary of the Interior.

Countersigned:
H. E. PAINE,
Commissioner of Patents.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 18.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

400 This is to Certify that the annexed is a true copy from the Bound Volumes of the Library of this Office of the Specification and Drawing in the matter of the German Letters Patent to George Webb, Dated December 5, 1890, Number 58,927, Auswechselbares Reservoir fur Gasbeleuchtungsapparate von Fahrzeugen.

Attached, hereto, is a true copy of a Translation of said Specification made by the Official Translator.

Said patent received in the Library October 17, 1891.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington

this second day of March, in the year of our Lord, one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Assistant Commissioner of Patents.

Kaiserliches Patentamt.

Ausgegeben Den 21 September, 1891.

Kaiserliches Patentamt.

Patentschrift No. 58,927.

Klasse 26: Gas-Bereitung und -Beleuchtung.

George Webb in London.

Auswechselbares Reservoir für Gasbeleuchtungsapparate von Fehrzeugen.

Patentirt im Deutschen Reiche vom 5 December, 1890, *ab.*

Obgleich man shon seit langerer Seit Fahrzeuge, wie Eisenharn-Pferdebahnwagen, Omnibusse, grösstentheils mit Gasbeleuchtung versehen hat, war es bisher doch nicht möglich gewesen, einen solchen Wagen tage—oder wochenlang laufen zu lassen, ohne den Gasvorrath zu ergänzen, da die an jedem Wagen ein—für
401 allemal befestigten Gasbehälter nur klein waren, keinen bedeutenden Druck aushalten konnten und jeden Tag neu gefüllt werden mussten.

In der nachfolgend beschriebenen und durch die Fig. 1 bis 8 dargestellten Erfinding ist nun ein Apparat bezw. eine Combination von Apparaten geschaffen, durch welchen es möglich wird, einen Wagen tage—und wochenlang beleuchten zu konnen, ohne dass eine Erneuering des Gasvorrathes während diesar Seit nothwendig wird.

Es ist dieses Verfahren ferner dadurch ausgezeichnet, dass der Gasbehälter, trotzdem er für eine so viel längere Zeit Gas liefern soll, nicht nur nicht grösser, sondern sogar kleiner ist als die bisher benutzten Gasbehälter.

Ein weiterer wesentlicher Vorzug der Einrichtung ist schliesslich der, dass man den Gasbehälter, nachdem er all sein Gas abgegeben hat, einfach von dem betreffenden Wagen entfernen und durch einen anderen, Gefüllten Gasbehälter ersetzen kann, eine Manipulation, welche kaum 1 Minute dauert und somit bei Eisenbahnen selbst da ausgeführt werden kann, so nur ganz kurze Haltepausen sind.

Der wesentliche Theil der Einrichtung besteht in einer starken stählernen Flasche A, Fig. 1 bis 3, welche auf einen Druck von über 200 Atmosphären geprüft ist. Es wird diese Stahlflasche unter einem Druck von 150 Atmosphären mit gas gefüllt und dann durch

einen geeigneten Hahn verschlossen, welchen Fig. 5 im Querschnitt derstellt und welcher weiter unten eingehend beschrieben werden wird.

Mit dem Hahn ist ein T-Stück *w v* durch eine Schraube *u* verbunden. Des zweite Ende des T-Stückes ist mit einem Manometer P in Verbindung, und das dritte Ende des T-Stuckes führt zu einem Reducirventil V von eigenartiger Construction, welches in Fig. 4 im Durchschnitt dargestellt ist und in der Technik unter dem Namen "Beard's Reducirventil" bekannt ist. Von dem Reducirventil führt ein Rohr P zu einem sogen. Carburator C, d. h. zu einem Apparat, in welchem Gase mit flüchtigen Kohlenwasserstoffen gesättigt werden, um sie entweder brennbar zu machen oder ihre Brennbarkeit zu erhöhen. Von dem Carburator führt nun ein Rohr P^1 zu einer oder auch zu mehreren Gasflammen, welche naturlich sowohl frei (*j*, Fig. 1) oder in Laternen eingeschlossen (L, Fig. 3) sein können.

Wie es wohl ohne Weiteres klar ist, hat das Reducirventil den, Zweck, nur so viel Quantität Gas durchzulassen, wie zur Speisung der betreffenden Flamme oder Flammen nothwendig ist. Da
402 nun aber das Gas durch den starken Druck, unter welchem es sich befindet, etwas van seiner Leuchtkraft einbüsst, so ist der Carburator C vorgeschen, welcher dem Gas seine normale Leuchtkraft wiedergiebt.

Es ist die ganze Rohrleitung nebst dem Carburator, dem Reducirventil und dem Manometer ein—für allemal mit dem betreffenden Fahrzeug verbunden; der einzige Thiel, welcher entfernt werden kann, ist, wie schon erwähnt, die Gasflasche, welche in einem passenden Behälter und an einem passenden Ort am Wagen derart angeordnet ist, dass man sie leicht entfernen und auch ihre Verbindung mit den ubrigen Theilen der Anlage leicht lösen bezw. leicht wieder herstellen kann. Bei der in Fig. 1 dargestellten Anonrdnung ist ein Manometer vorgesehen und es sind das Reducirventil und der Carburator durch ein Rohr verbunden.

Der Manometer kann in besonderen Fällen fortfallen (Fig. 2), und es kann auch das Reducirventil mit dem Monometer direct zusammen montirt werden, wie es z. B. Fig. 2 zeigt. Es hangt dies vollständig von der Bauart des betreffenden Wagens und von der Anzahl der zu speisenden Flammen ab.

Der bereitz oben erwähnte, an dem Gasbehälter befindliche Hahn ist folgendermassen construirt:

Das Hahngehäuse B hat drei mit Gewinde verehene Ansätze a^1 u und *g*, von denen der Theil a^1 direct in der Gasflasche ist und stets in derselben verbleibt. Im Innern des Hahngehäuses B befinden sich drei Kanäle ii^1 i^2, von denen *i* und i^2 das Gahäuse in etwas schräger Richtung durchlaufen und durch den Kanal i^1 verbunden werden Der Kanal i^1 ist nach dem Theil *g* zu verbreitert und mit einem Gewinde versehen, in welchem der mit dem Vierkantknopf *d* und dem Gewinde *o* versehene Hann *b* auf- und niederbewegt werden kann. Auf das Gewinde des Theiles *g* wird der Theil *f* einer Hülse c^3 aufgeschraubt, welche innen einen Ansatz *t* trägt, durch welchen verhindert wird, dass das im Bahälter A enthaltene Gas, falls sich das Gewinde *o* durch langen Gebrauch abnutzt, den Hahn *b* heraus-

schleudern kann, was zu Unglücksfällen Veranlassung geben könnte. Falls bei dieser Construction ein solcher Fall eintreten würde, könnte der Hahn b nur bis an den ansatz t gelangen, da das Gewinde hier einen Anschlag und Halt findet.

Das Reducirventil (Fig. 4) ist folgendermassen construirt:

Das Rohr S, welches mit dem Gasbehälter A Verbindung steht, mündet mit seinem Kanal q^1 in einen starken Metallbehälter v, von welchem das Rohr r zum Carburator führt. Mit dem Gehäuse
403 v ist ein zweites Gehäuse V fest verbunden, dessen Wandung kk^1 ebenfalls aus starken Metall besteht. Im Theil v ist ein Arm b^1 befestigt, an dessen Endpungt o^1 die Arme n einer sogen. Nürnberger Scheere befestigt sind, welch einerseits durch einen Stift n^1 an einen Klotz a^1 und andererseits an einen Klotz p^2 befestigt. sind. Letzterer trägt einen konischen Ansatz q, welcher in den ebenfalls konisch geformten Kanal q^1 hineinreicht und denselben öffnen bezw. verschliessen kann. Der Klotz a^1 ist durch einen Bolzen o mit einem Gehäuse e verbunden dessen gewellte Wandung m ebenfalls im Gehäuse v befestigt ist.

Es ist nun Weiteres klar, dass der durch das Gas auf den Konus q ausgeübte Druck ein Verkürzen der Scheere n herbeiführen muss. Da nun aber die Scheere n durch den Arm b^1 gehalten wird und an der entgegengesetzten Seite denselben Druck, den sie empfing, auf das Gehäuse e m überträgt, so kann stets nur eine ganz bestimmte Menge Gas durch den Kanal q^1 entweichen, gleichgültig, wie der Druck im Innern des Gasbehälters ist.

Der Carburator ist in den Fig. 6 bis 8 dargestellt und besteht zunächst aus einem Metallgehäuse B, Fig. 6, welches durch verticale Scheidewände p in drei Kammern getheilt ist. Der Deckel L dieses Gehäuses wird durch Schrauben ss^1 befestigt, nachdem eine Gummischeibe r zwischen ihm und den Seiten des Gehäuses eingeschaltet ist. Ueber jeder Abtheilung befindet sich ein Kanal i^1 i^2, welcher durch einen Deckel cc^1 c^2 verschlossen werden kann und zum Einfüllen flüssiger Kohlenwasserstoffe, wie z. B. Gasolin, Bensol, Benzin, Naphtol, dient. Je zwei Kammern sind durch eine Röhre bb^1 derart verbunden, dass das aus der einen Röhre in die andere strömende Gas stets den ganzen Theil des Behälters durchlaufen muss, und zwar die Röhren bb^1 etwas enger gewählt, wie das Gaszuleitungsrohr a und das Gasabführungsrohr o, damit das Gas die Behälter CC^1 C^2 mit etwas grösserer Geschwindigkeit durchfliesst und auch eine grössere Menge der Kohlenwasserstoffgase aufnimmt.

Im Innern der Behälter CC^1 C^2 befinden sich ausserdem poröse Stoffe, wie z. B. Schwämme S, welche von den flüssigen Kohlenwasserstoffen durchtränkt werden und sich direct im Wege des Gasstromes befinden, so dass sich diesem letzteren eine möglichst grosse Oberfläche darbietet.

In solchen Fällen, in denen nur zwei Abtheilungen C Verwendung finden sollen, wird die Röhrenanordnung derart getroffen, wie es Fig. 8 zeigt, wobei also auch der Gasstrom einen möglichst
404 grossen Weg in den einzelnen Abtheilungen zurücklegen muss.

Wie bereits erwähnt, ist der Carburator auch ein- für allemal an

dam betreffenden Fahrzeug befestigt, und natürlich derart, das man zu den Einfüllöffnungen *ii i* leicht gelangen kann.

Es ergiebt sich nun, dass sich durch diese vorbeschriebene Anordnung ein Wagen sehr lange Zeit erleuchten lässt, da die in dem Gasbehälter unter so ungeheurem Druck aufgespeicherte Gasmenge eine ganz bedeutende ist, wobei man aber doch vollkommene Sicherheit gegen eine Explosion hat, da die Gasflaschen, welche aus kalt gezogenem Stahl bestehen, auf einen weit höheren Druck geprüft werden, als sie später im praktischen Gebrauch aushalten sollen.

Welche Betriebserleichterungen sich daraus ergeben, wenn man bei einem grossen Wagenpark die Neufüllung der Gasbehälter nicht täglich, sondern vielleicht nur monatlich einmal vorzunehmen braucht, ist augenscheinlich, und noch bedeutender ist der Vortheil, dass selbst solche Verkehrseinrichtungen ihre Fahrzeuge mit Gas versehen können, denen keine Vorrichtung zum Füllen des Gasbehälters zur Verfügung steht, da man ja die Gasbehälter beliebig abnehmen, durch gefüllte ersetzen und die leeren dann einfach zur Füllung nach dem Gaswerk hinschicken kann.

Patent-Anspruch.

Ein transportabler Apparat zum Beleuchten von Fahrzeugen mit Gas, bestehen aus einem auswechselbaren, starken, aus kalt gezogenem Stahl bestehenden Reservoir, in welchem das Gas unter einem Anfangsdruck von mindestens 150 Atmosphären eingepresst ist, in Verbindung mit einem Reduzirventil und einem Carburator, welche nebst der Rohrleitung stets in oder an dem betreffenden Fahrzeug befestigt sind, während der Gasbehälter nach Verbrauch seines Inhalts von der Rohrleitung entfernt und durch ein gefülltes Reservoir ersetzt werden kann.

Translation.

Kaiserliches Patentamt.

Patentschrift.

Klasse 26: Gas-Bereitung und -Beleuchtung.

German Patent No. 58927.

George Webb, London.

405 Exchangeable Tank for Gas-Lighting Apparatus of Vehicles.

Patented in the German Empire from December 5, 1890.

Published September 21, 1891.

Although the greater part of such vehicles as railway cars, street cars, busses, etc., have for some time been lighted by gas, such

vehicles have heretofore not been able to run for days or weeks without having their gas supply renewed, owing to the fact that the gas tanks, which are permanently secured to each car, are but small, unable to resist high pressures, and have to be refilled each day.

By the invention described below and illustrated by figs. 1 to 8, an apparatus, or combination of apparatus, have been created whereby it becomes possible to light a car for days or weeks without the necessity of renewing the gas supply during that time.

Another characteristic feature of this process is that the gas tank, although intended to supply gas for a much longer period of time, is not only not larger than the gas tanks heretofore used, but even smaller.

Another essential advantage of the apparatus is, finally, the fact that the gas tank, after giving off all of its gas, is simply detached from its car and replaced by a full gas tank, an operation which takes hardly a minute, so that it can be attended to, in

G. P. 58927.

the case of railway trains, even at places where only very short stops are made.

The essential part of the apparatus is a strong steel bottle A, figs. 1 to 3, which has been tested to a pressure of over 200 atmospheres. This steel bottle is filled with gas at a pressure of 150 atmospheres and then closed by a suitable cock, which latter is shown in cross-section in fig. 5 and will be described more particularly below.

With the cock is connected a T-piece *w v* by means of a screw *u*. The second end of the T-piece is connected with a pressure gauge P, and the third end of the T-piece leads to a reducing valve V of special construction, which is shown in cross-section in fig. 4 and known in engineering under the name of Beard's reducing valve. From the reducing valve a pipe P leads to the so-called carburetter C—that is to say, to an apparatus in which gases are saturated with gaseous hydrocarbons either to render them combustible or to increase their combustibility. From the carburetter a pipe P^1 leads to one or more gas jets, which may of course be either open (*j*, fig. 1) or enclosed in lamps (L, fig. 3).

406 It will at once be understood that the object of the reducing valve is to allow only as much gas to pass through as is necessary to feed the respective jet or jets. But as the gas loses some of its illuminating power owing to the exceedingly high pressure to which it is compressed, the carburetter C is provided, which restores to the gas its normal illuminating power.

The entire piping, together with the carburetter, the reducing valve and the pressure gauge, is permanently connected with the respective car. The only part susceptible of being removed, as stated above, is the gas bottle, which is so fitted

G. P. 58927.

in a suitable casing and at a suitable place on the car that it can be easily removed and easily disconnected from and reconnected to the remaining parts of the installation. In the arrangement shown in

fig. 1 a pressure gauge is provided, and the reducing valve and carburetter are connected by a pipe.

In special cases the pressure gauge may be dispensed with (fig. 2); or the reducing valve may be connected directly with the pressure, gauge, as shown, e. g., in fig. 3. This depends entirely on the construction of the respective car and on the number of jets to be fed.

The cock on the gas bottle, referred to above, is constructed as follows:

The chest B of the cock is provided with three screw threaded prolongations a^1, u and g, the first of which, a^1, is secured directly in the gas bottle, where it is intended to be left permanently. Inside of the chest B are three passages i i^1 i^2. i and i^2 pass through the chest in slightly inclined position and are connected with each other by the passage i^1. The passage i^1 widens in the direction of part g and is provided with screw thread, in which the cock b, fitted with a square end d and screw thread o, is susceptible of being moved up and down. On the threaded part of g is screwed part f of a casing c^3, which has on the inside a projection t designed to prevent the cock b from being blown out by the gas contained in the bottle A in case the thread o should have become worn by long use, which might result in accidents. If such a contingency should arise in this construction, the cock b would not be able to go any further than the projection t, against which the screw thread would abut and be stopped.

The reducing valve (fig. 4) is constructed as follows:

The pipe S, connected with the gas vessel A, enters by

means of its channel q^1 a strong metal box y, from which the pipe r leads to the carburetter. The box y is connected with another box V, the walls k k^1 of which are likewise made of strong metal. In the box y an arm b^1 is secured, to the end o^1 of which the arms of so-called lazy tongs are fixed one end of which is fastened by a pin n^1 to a block a^1 and the other end to a block p^2. The latter has a conical prolongation q, which extends into the likewise conical passage q^1 and is suscepticle of opening and closing the same. The block a^1 is secured by a bolt o to a casing e, the corrugated walls m of which are also secured in the box V.

It will at once be apparent that the pressure exerted by the gas on the cone q must cause the lazy-tongs to shorten.

But as the lazy tongs n are held by the arm b^1 and transmit at the opposite end to the casing e m the same pressure which they receive, only a very definite amount of gas is enabled to escape through the passage q^1 at any time, whatever may be the pressure in the interior of the gas vessel.

The carburetter is shown in figs. 6 to 8 and consists essentially of a metal box B, fig. 6, which is divided by vertical partitions p into three compartments. The cover L of this box is fastened by means of screws s s^1, a sheet of rubber r being interposed between the cover and the sides of the box. Above each compartment is a passage i i^1 i^2, susceptible of being closed by a cap c c^1 c^2, and intended to be

484

Fig 1.

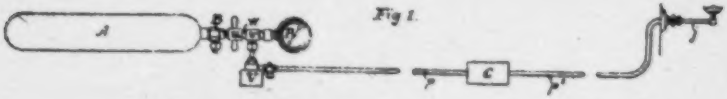


Fig 2.

Fig 3

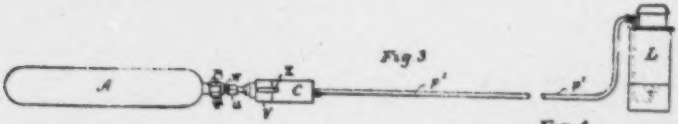


Fig 4.

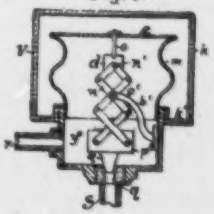


Fig 5.

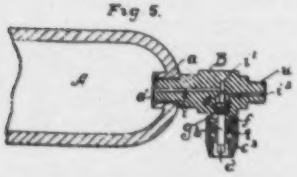


Fig 6

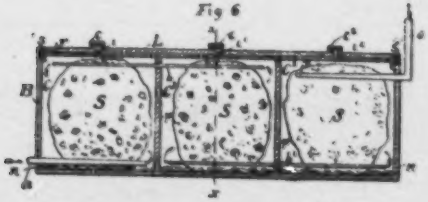
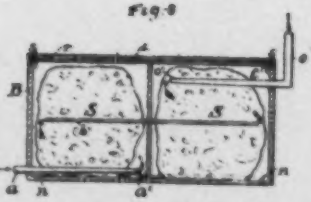


Fig 7

Fig 8



used as inlets for fluid hydrocarbons, such as gasoline, benzole, benzene, naphthol, etc. The compartments are connected two and two by pipes b b^1 in such manner that the gas passing from one pipe into the other will always be compelled to flow through the entire space of the compartment. The pipes b b^1 are of somewhat smaller diameter than the gas-inlet pipe a and the

G. P. (58927.)

gas-outlet pipe o so as to enable the gas to flow a little more rapidly through the compartments C C^1 C^2 and also to absorb a larger amount of hydrocarbon gases.

Inside of the compartments C C^1 C^2 are, moreover, porous substances such as sponges S, which are saturated by the fluid hydrocarbons and are directly in the path of the flow of gas, so that the largest possible surface is presented to the latter.

In cases where only two compartments C are to be used, the pipes are arranged as shown in fig. 8, in which the current of gas is likewise compelled to travel the longest possible distance through each compartment.

408 As stated above, the carburetter is also permanently secured to the car and of course in such manner as to render the filling openings i i^1 i^2 easily accessible.

It will be understood that the above described arrangement renders it possible to light a car for a long period of time, since the amount of gas stored in the gas vessel at such enormous pressure is very large, while at the same time it affords perfect guaranty against explosions, because the gas bottles, which are made of cold drawn steel, are tested to a much higher pressure than they are afterwards expected to withstand in practical use.

It is obvious that where there are a large number of cars the operation is greatly facilitated by the fact that the gas vessels do not have to be refilled every day, but perhaps not more than once a month; and a still greater advantage is the fact that even those conveyances which have no provisions for filling gas tanks are enabled to be supplied with gas, since the exhausted gas vessels can be removed whenever desired, replaced by full ones, and the empty ones sent to the gas works to be refilled.

(G. P. 58927.)

Claim.

A portable apparatus for lighting vehicles with gas, consisting of a strong exchangeable vessel made of cold drawn steel, in which the gas is compressed to an initial pressure of at least 150 atmospheres, in combination with a reducing valve and a carburetter, which, together with the piping, are permanently secured in or on the respective vehicles, while the gas vessel, after its contents have been exhausted, is susceptible of being disconnected from the pipes and replaced by a full vessel.

N. E. K.
2-14-11.

(Here follows drawing marked page 409.)

410 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANT'S EXHIBIT No. 19.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Robert Munn Dixon, Assignor to the Safety Car Heating and Lighting Company, Number 567,764, Granted September 15, 1896, for Improvement in Gas-Holders.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 10th day of January, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Robert Munn Dixon, of East Orange, New Jersey, has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Gas-Holders.

He having assigned his right, title, and interest, in said improvement, to the Safety Car Heating and Lighting Company, of New Jersey a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and

411 & 412 Whereas upon due examination made the said claimant is adjudged to be justly entitled to a patent under the law;

Now therefore these Letters Patent are to grant unto the said Saftey Car Heating and Lighting Company, its successors or assigns for the term of seventeen years from the fifteenth day of September, one thousand eight hundred and ninety-six, the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In Testimony Whereof I Have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fifteen day of September, in the year of our Lord one thousand eight hundred and ninety-six, and of the Independence of the United States of America the one hundred and twenty-first.

[SEAL.] JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:
S. T. FISHER,
Acting Commissioner of Patents.

(Here follow drawings, marked pages 413 and 414, and specification, marked pages 415 and 416.)

(No Model.)

2 Sheets—Sheet 1.

413

R. M. DIXON.

GAS HOLDER.

No. 567,764.

Patented Sept. 15, 1896.

Fig. I.

Fig. III.

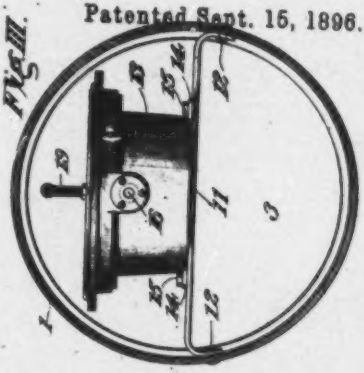
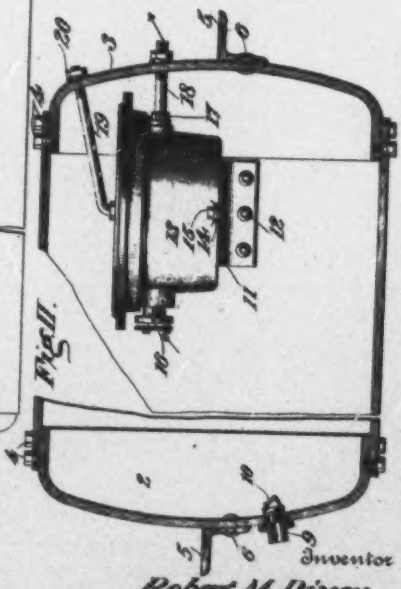


Fig. II.



Witnesses:

M. E. Fowler

Snaikes

Inventor

Robert M. Dixon

By Joseph L. Atkins

Attorney

(No Model.) 2 Sheets—Sheet 2.

414

R. M. DIXON.

GAS HOLDER.

No. 567,764. Patented Sept. 15, 1896.

Fig. V.

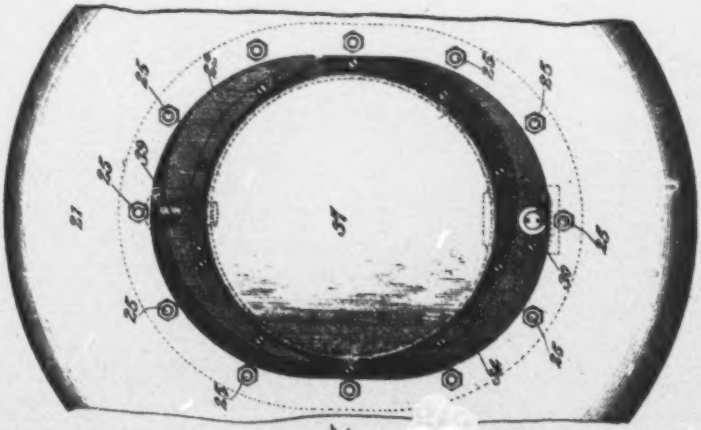


Fig. IV.

Witnesses
M. E. Fowler
S. Mackey

Inventor
Robert M. Dixon
By Joseph L. Atkins
Attorney

UNITED STATES PATENT OFFICE. 415

ROBERT MUNN DIXON, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO THE SAFETY CAR HEATING AND LIGHTING COMPANY, OF NEW JERSEY.

GAS-HOLDER.

SPECIFICATION forming part of Letters Patent No. 567,764, dated September 15, 1896.

Application filed January 7, 1896. Serial No. 574,378. (No model.)

To all whom it may concern:

Be it known that I, ROBERT MUNN DIXON, of East Orange, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Gas-Holders for Railway-Cars or the Like, of which the following is a specification, reference being had to the accompanying drawings.

The object of my invention is to produce certain improvements in gas-lighting systems especially designed for railway service in which the gas to be utilized is stored under high pressure until required for use. In systems of this description it is necessary to reduce the high-pressure gas to a pressure low enough to render it available in the usual burners, for example. This reduction of pressure is usually accomplished by what is known in the art as a "regulator."

Heretofore where regulators for railway-car service have been employed they have been connected to the receiver by pipes, for example.

Broadly stated, my invention consists in the incorporation of a regulator into a receiver, thereby dispensing with much of the piping now employed, in that way simplifying the system and at the same time completely protecting the regulator by the heavy walls of the receiver and making it impossible in an ordinary accident for any gas to issue from the receiver except under low pressure, in which state it is comparatively harmless.

The specific features of my invention, as distinguished from its generic form, will be hereinafter defined in the specification and succinctly set forth in the appended claims.

In the accompanying drawings, Figure I is a side elevation of a portion of a car, with one of my receivers attached. Fig. II is a central vertical section of one end of a receiver with the regulator shown in elevation. Fig. III is a transverse section thereof, looking toward the regulator. Fig. IV is an end view of a modified form of my invention. Fig. V is a transverse section thereof, taken through the regulator, with the operative parts of the regulator, except the flexible diaphragm, omitted.

Referring to the figures on the drawings, 1 indicates the body part of the receiver, being preferably a cylinder of heavy plate metal.

2 indicates one head thereof, and 3 the other, the heads being secured to the body part, as by tap-bolts 4, serving to securely unite the heads to the body part by gas-tight joints.

5 indicates brackets secured to the heads by rivets 6, by means whereof the receiver may be secured to hangers 7, that suspend it from the under side of the car-body 8.

9 indicates a gas-supply inlet, the outflow from which is controlled by any suitable valve mechanism, as, for example, an ordinary gravity check-valve 10.

11 indicates a bridge secured, as by rivets 12, to the opposite sides of the cylinder 1 near the head 3.

13 indicates any suitable gas-regulator, which may be provided with lugs 14, by means whereof bolts 15, extending through openings in the same and screwing into the bridge 11, may firmly secure the regulator in place within the receiver.

The details of the regulator, being perfectly understood in the art and constituting no part of my invention, are not illustrated. It is deemed sufficient for the present purpose to specify that the regulator is provided with the usual regulator-inlet 16 and low-pressure outlet 17, the regulator-inlet opening directly into the receiver, while the low-pressure outlet communicates, as by a pipe 18, passing through the wall of the head 3, with the lamp system or other pipe system (not illustrated) of the car.

19 indicates a pipe communicating at one end with the interior of the regulator above the diaphragm and extending through air-tight connection 20 at the other end to the outside of the head 3, and which serves to insure atmospheric pressure only on the upper side of the diaphragm, thereby securing the proper automatic regulation of the degree of pressure through the low-pressure outlet 17 and pipe 18.

Let it be observed in this connection that the regulator is entirely surrounded and protected at all points by the heavy walls of the receiver.

If it should become necessary to repair the

regulator in any wise, the bolts 4 may be unscrewed and the head 3 taken out for that purpose.

In Figs. IV and V of the drawings I illustrate a modified form of apparatus. In these figures the head of the receiver (indicated by 21) is provided with a circular opening 22, concentric with the axis of the cylindrical receiver. Within this is a concave or dish-shaped head 24, secured as by bolts 25, an annular gasket 26 being secured between the edge of the head 24 and the head 21 to insure a tight joint. The wall of the head 24 being of equal thickness with that of the head 21 the strength of the receiver is unimpaired, and on account of its shape the regulator located within it is entirely protected by it. The annular wall of the head 24 is preferably cast thick enough to accommodate a high-pressure inlet 27, that is controlled by a conical valve 28, whose stem 29 may be turned by a wrench from the outside of the receiver, as required. A bushing 30 may be employed between the metal of the head 24 and the valve-stem 29.

31 indicates an internally-screw-threaded socket within which the nipple of the regulator-valve mechanism (not illustrated) may be screwed. The valve mechanism of the regulator proper is, as above suggested, purposely omitted, the only portion thereof which is shown being the well-known flexible diaphragm 32, that is secured against the annular face 33 of the head 24, as by a ring 34, and its intermediate gasket 35. The ring 34 preferably carries a rim 36, to which may be screwed a cap 37, the cap 37 being provided with an air-hole 38, corresponding in office to the pipe 20 above mentioned.

By the employment of the dish-shaped head 24 and the cap 37 the regulator is entirely incorporated within the receiver and is as fully protected thereby as in the form of embodiment of my invention shown in Figs. I to III, inclusive. I prefer the form shown in Figs. IV and V, however, because of the facility with which access to the interior of the regulator may be gained for repairing or adjusting the mechanism.

39 indicates the low-pressure outlet, which establishes communication between the interior of the regulator and the lamp or pipe system, supplying gas from the former to the latter under low pressure.

What I claim is—

1. The combination with a gas-receiver, of a pressure-regulator incorporated within the same and protected by the walls thereof, substantially in the manner and for the purpose specified.

2. The combination with a gas-receiver, of a pressure-regulator inclosed within the same, and having its exterior pipe connections embodied within the walls of the receiver, substantially as set forth.

3. The combination with a gas-receiver, and pressure-regulator contained therein, of a high-pressure gas-inlet communicating with the regulator and opening directly into the receiver, without an intervening connection of any kind, substantially as set forth.

4. The combination with a gas-receiver head and opening therein, of a dish-shaped head, means for securing said parts together, and pressure-regulating mechanism carried within the dish-shaped head, substantially as set forth.

5. The combination with a gas-receiver head, dish-shaped head secured thereto, and pressure-regulating mechanism therein, of a low-pressure outlet opening from the face of the dish-shaped head, a high-pressure inlet formed in the wall thereof, a valve controlling the high-pressure inlet, and mechanism for operating said valve on the outside of the dish-shaped head, substantially as set forth.

6. The combination with a gas-receiver head, and dish-shaped head secured thereto, of a high-pressure inlet and low-pressure outlet in the wall of said dish-shaped head, and a flexible diaphragm secured across the face of the dish-shaped head, substantially as set forth.

7. The combination with a gas-receiver head and dish-shaped head secured thereto, of a high-pressure inlet and low-pressure outlet in the wall of said dish-shaped head, a flexible diaphragm secured across the face of the dish-shaped head, and a cap secured to the wall of the head and covering the diaphragm, substantially as set forth.

8. The combination with a receiver-head, dish-shaped head secured thereto, and a high-pressure inlet and low-pressure outlet in the walls thereof, of an annular face upon the dish-shaped head, a ring, means for securing the ring to the face, a flexible diaphragm secured between the ring and the annular face, and a cap secured to the ring, substantially as set forth.

In testimony of all which I have hereunto subscribed my name.

ROBERT MUNN DIXON.

Witnesses:
E. W. BULKLEY,
C. P. LAWTON.

417 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 20.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Bound Volume and Drawing in the matter of the British Letters Patent to Ernest George Gearing, Dated November 16, 1894, Number 22,183, for Improved Gas Lamps, and Preparation of Material for use therein.

In testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 14th day of February, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

No. 22,183. A. D. 1894.

Date of Application, 16th Nov., 1894.

Complete Specification Left 16th Aug., 1895; Accepted 21st Sept., 1895.

Complete Specification.

Improved Gas Lamps, and Preparation of Material for Use Therein.

I, Ernest George Gearing, of Penhurst, Clarence Drive, Harrogate, Engineer, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:

It is a well known chemical fact that if the carbides of certain metals, such as the carbide of calcium or of barium, be brought in contact with water, the carbide is decomposed, the metal
418 uniting with the oxygen of the water to form an oxide, which is converted into a hydrate by an excess of water, whilst the carbon of the carbide unites with the hydrogen of the water to form the hydrocarbon gas known as acetylene. Now my invention has for its object the practical application of this known method of producing acetylene and of the gas so produced in lighting, and has reference for this purpose to a construction of gas lamps wherein the gas is generated, stored under pressure, and fed to the burner or burners of the lamp at a reduced pressure suitable for maintaining the desired flame as also to the preparation of the carbide to be used for generating the gas in the lamp.

My lamp comprises a generating vessel such as hereinafter referred to, a reducing valve, a tap or cock and a suitable burner or burners.

Referring to the illustrative drawing hereto appended which shows in vertical section a convenient arrangement of a portable lamp according to my invention, *a* is the generating vessel consisting of a strong vessel of suitable metal such as steel or iron, of cylindrical form in cross section, with hemispherical ends, and which may conveniently (though not necessarily) be about four inches in diameter and sixteen inches in height; it is constructed with an opening *b* at top, through which can be introduced water, as also cartridges, sticks or pieces of prepared carbide *c* such as hereinafter described, and which opening is fitted with a screw plug *d* containing a small chamber *e* that is filled with asbestos e^1 and has a small hol*d* *f* formed through its top. b^1 is a supplementary opening that is normally closed by a plug and through which the vessel *a* can, when necessary, be supplied with water without removing the screw plug *d*. Through the bottom of the generating vessel also there is formed a hole *g* which is furnished with an appropriate closing device such as a screw plug *h* by removing which the interior of the generating vessel can be cleared of the material remaining as a product of the decomposition which occurs in the process of generating the gas. Above the small chamber *e* is the reducing valve *i* which is screwed into the chamber *e* and with which the small hole *f* communicates, and above the reducing valve, there is arranged (at 1) the burner (which is not shown but may have the usual fittings) a tap or cock being interposed. For generating gas in this lamp I prepare carbide as follows:

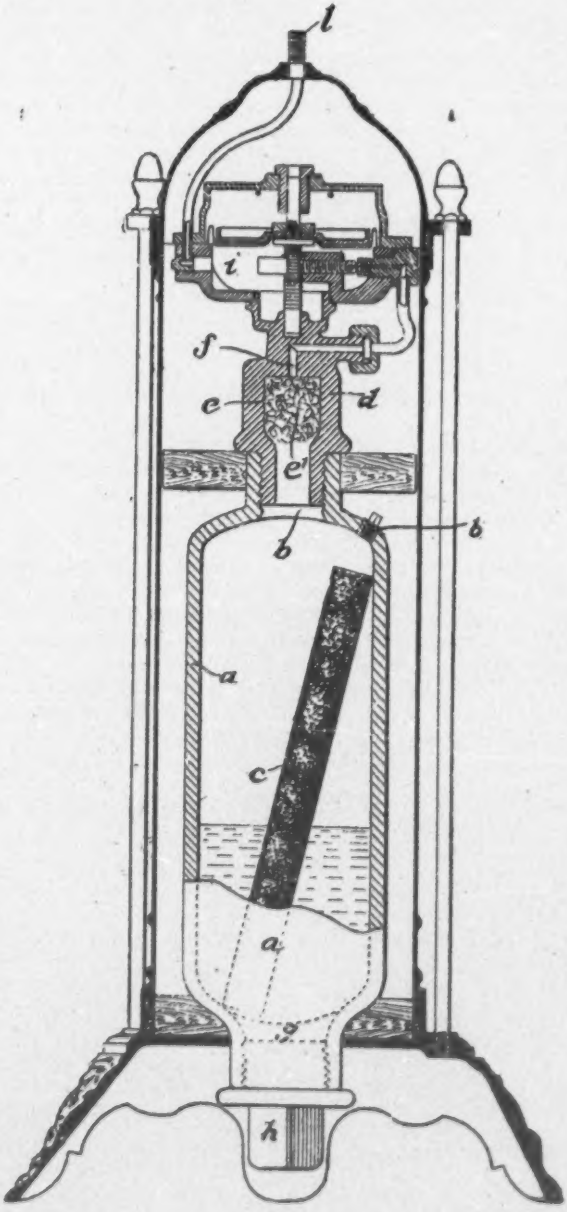
I take calcic carbide, prepared by the direct action of lime on carbon in the electric furnace, or by any other process, and make it into cartridges, sticks or pieces of convenient size, which I coat on the surface with a glaze or film of soluble substance such as gelatine, glue, or soluble varnish, to protect them from the action of the moisture in the atmosphere. I consider it profitable to cast the molten carbide direct from the hearth of the furnace into sticks, or blocks of convenient size, as I find it then less liable to be affected by air than if crushed and rammed into cartridge form. I find approximately that a pound of calcic carbide will form a stick about an inch and a quarter in diameter and twelve inches long, and when decomposed by water will yield five cubic feet of acetylene, which, in a cylinder sixteen inches long by four inches in diameter will develop an initial pressure of about eight hundred pounds on the square inch.

419

As the water in the generating vessel dissolves the protective coating from the surface of the carbide, the generating process commences and the acetylene liberated is compressed in the generating vessel under the pressure created by its evolution, and with such a lamp as is above referred to, which I have found to maintain its flame for many hours, I have obtained a light of some forty-five candles when only consuming about one cubic foot of gas per hour.

The generating vessel of the lamp may be supported in a decorative stand of any desired shape, and may be fitted with a dial gauge

498



323

which will indicate the quantity and pressure of gas remaining in the vessel. Furthermore, generating vessels of larger size than I have indicated may be employed, and be provided with any desired number of burners—and the gas generated as I have described, may pass from the generating vessel to a supplementary vessel forming a storage reservoir which may in turn communicate with the reducing valve and burner or burners. Thus it will be understood that my invention may be employed with advantage for lighting various parts of a house or other establishment in various parts of which burners may be fixed that are placed in communication through suitable cocks and reducing valves with the reservoir of the gas generated from carbide prepared as hereinabove described.

Furthermore, as will also be readily understood, my invention may with advantage be employed for the lighting of railway and tramway carriages.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed I declare that what I claim is:

1. My improved portable gas generating lamp as described and shewn wherein the gas is generated from calcic carbide as set forth.

420 2. A lamp comprising a gas generating vessel such as hereinabove referred to, a reducing valve (or valves), a tap or cock (or taps or cocks), and a suitable burner or burners the whole adapted and [*and*] arranged for generating and burning acetylene substantially as described.

3. For use to generate acetylene as set forth, calcic carbide made into sticks or pieces of convenient size, coated on the surface with a glaze or film of soluble substance as hereinabove described to protect them from the action of the moisture in the atmosphere.

4. The use in my improved lamps as and for the purpose specified of calcic carbide prepared in the manner described.

Dated this 16th day of August, 1895.

ERNEST GEORGE GEARING.

W. LLOYD WISE,
46 *Lincoln's Inn Fields, London, W. C.,*
Agent for the Applicant.

(Here follows drawing marked page 421.)

422 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANT'S EXHIBIT No. 21.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Thomas Saunders and William Henry Patton, Number 394,018, Granted December 4, 1888, for Improvement in Heating and Lighting Cars.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 10th day of January, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

No. 394,018.

THE UNITED STATES OF AMERICA:

To All to Whom These Presents Shall Come:

Whereas Thomas Saunders and William Henry Patton, of Pueblo, Colorado, *has* presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Heating and Lighting Cars, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and *has* complied with the various requirements of law in such cases made and provided; and

Whereas upon due examination made the said claimant- *is* adjudged to be justly entitled to a patent under the law;

423 Now therefore these Letters Patent are to grant unto the said Thomas Saunders and William Henry Patton, their heirs or assigns for the term of seventeen years from the fourth day of December one thousand eight hundred and eighty-eight the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this fourth day of December, in the year of our Lord one thousand eight hundred and eighty eight and of the Independence of the United States of America the one hundred and thirteenth.

[SEAL.] D. L. HAWKINS,
Assistant Secretary of the Interior.

Countersigned:
BENTON J. HALL,
Commissioner of Patents.

G. W. O.
C. S. C.

(Here follows drawing, marked page 424, and specification, marked pages 425 and 426.)

(No Model.)

424

T. SAUNDERS & W. H. PATTON.

HEATING AND LIGHTING CARS.

No. 394,018. Patented Dec. 4, 1888.

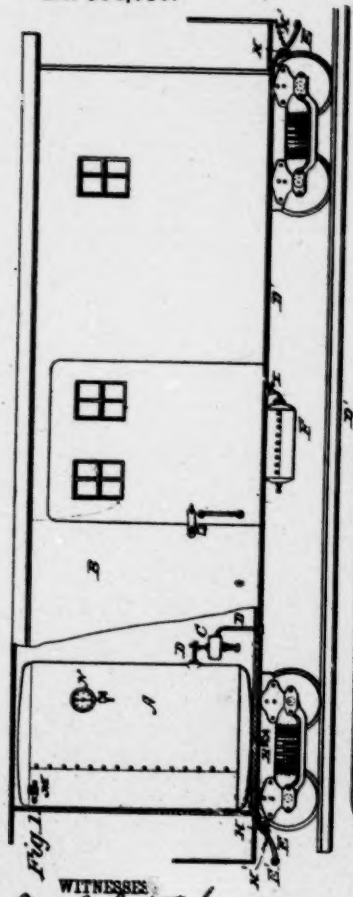


Fig. 1.

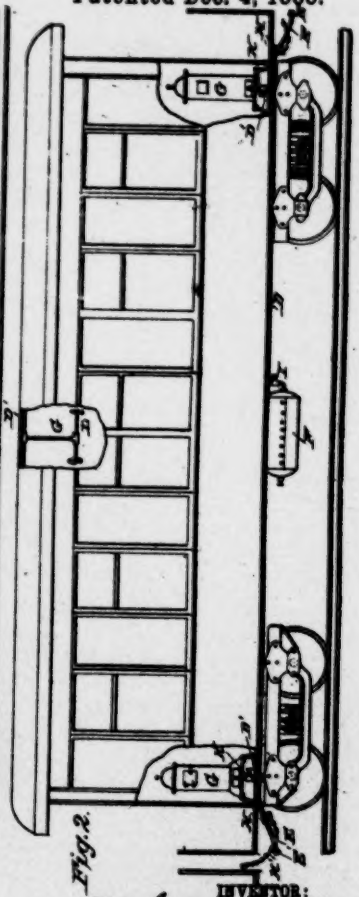


Fig. 2.

WITNESSES:
Fred G. Dieterich.
Glen E. Kemon.

INVENTOR:
Thos. Saunders,
Wm H. Patton.
BY Munn & Co
ATTORNEYS.

UNITED STATES PATENT OFFICE. 425

THOMAS SAUNDERS AND WILLIAM HENRY PATTON, OF PUEBLO, COLORADO

HEATING AND LIGHTING CARS.

SPECIFICATION forming part of Letters Patent No. 394,018, dated December 4, 1888.

Application filed May 26, 1887. Serial No. 238,487. (No model.)

To all whom it may concern:

Be it known that we, THOMAS SAUNDERS and WILLIAM HENRY PATTON, of Pueblo, in the county of Pueblo and State of Colorado, have invented a new and useful Improvement in Heating and Lighting Cars, of which the following is a specification.

Our invention relates to novel means for lighting and heating railroad-cars with gas; and the improvement consists, in general terms, in the combination, with a main storage-reservoir provided with a pressure-regulating valve located upon one of the cars to supply gas for lighting and heating the other cars of the train, of a smaller or auxiliary reservoir located upon each of the cars to be lighted charged with gas from the main or storage reservoir, and flexible pipe-connections, automatic valves and couplings for connecting the reservoir-pipes of one car with those of another car, as will hereinafter appear, and in certain other details of construction hereinafter particularly described, and set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation of the car carrying the main storage-reservoir, with a portion of the car broken away; and Fig. 2, a similar view of one of the passenger-cars provided with our improved apparatus, as will hereinafter appear.

The main storage-reservoir A is located upon one of the forward cars, B, of the train, preferably the baggage or mail car, and is connected with an automatic pressure-regulator valve, C, through pipes D, which extend from said regulator-valve and run under each car from end to end thereof.

The ends of the pipes D are connected between the cars by flexible pipes E and couplings E', similar to those used in connecting the pipes of air-brakes. The pipes D are connected by branch pipes D' with the gas fixtures and burners G, controlled, respectively, by valves K and L. Stop-valves H, at the ends of the pipes D, serve to open and close communication with each car. A stop-valve, I, between the reservoir F and pipes D, permits the said reservoir to be cut off from the gas-supply pipes D D', when desired. The main storage-reservoir has valves H^2 for the escape of accumulations in said reservoir, a valve, M, through which the reservoir may be charged with gas, and a gage, N, to indicate the pressure therein. The valves H are connected by chains H' with the adjoining car of a train to close the said valves automatically when the couplings and connections are broken by the separation of the cars at the time of an accident.

The main storage-reservoir A is capable of carrying a sufficient quantity of gas under high pressure to heat and light an ordinary train of cars while in transit between the supply-stations, where gas can be conveniently procured, and is charged by the use of an ordinary compression-pump attached to any gas supply or main. The pressure-gage upon the reservoir will indicate when the required pressure therein is attained, and when the cars are coupled together and the gas is being consumed the pressure-regulator valve secured to the storage-reservoir will open by the reduction of pressure in the delivery-pipes below a determined minimum, and may be of any well-known or preferred construction.

The delivery-pipes supply the burners from the main storage-reservoir when the train is made up, and gas is supplied to said burners from the auxiliary reservoirs when the cars are side-tracked or disconnected from the rest of the train.

In case of a wreck or accident to the train the cars will become uncoupled or telescoped in such manner as to break the connections between the pipe-couplings and instantly extinguish the lights and fires. When the cars separate, the chain from the platform to the valve upon the adjoining car will close said valve and will extinguish the lights, after which they may be relighted by opening communication with the auxiliary reservoir beneath the car.

It will be understood from the foregoing that the auxiliary reservoir F, charged at the supply-points in like manner to the main reservoir, is shut off by valve I, which latter is similar to the pressure-regulator valve employed on the main storage-tank from communication with the service-pipe D, except when the car carrying the same is side-tracked or is otherwise broken out of a train except in case of accident. In running the trains

426

the valves I of the auxiliary reservoirs are closed, so that in case of accident and closure of the valves H, in the manner before described, the lights and fires will be instantly extinguished, thus avoiding the danger of setting fire to the car or cars.

We claim as our invention and desire to secure by Letters Patent—

1. In a system of lighting and heating cars, the combination of a storage-reservoir located upon a car at one end of the train provided with a pressure-regulating valve, with the distributing and gas-supply pipes, the burners, and auxiliary reservoirs beneath said cars, and the valves H, having a connection with the contiguous cars, whereby the ends of the supply-pipes are automatically closed when the connections between the cars are broken, substantially as herein described.

2. In a system of lighting and heating cars, the combination of a storage-reservoir located upon a car at one end of the train and provided with a pressure-regulating valve, the gas-supply pipe and the pipes connected with said reservoir and regulator-valve and extending under each car, branch pipes connecting the supply-pipes with the burners, an auxiliary reservoir connected with said service-pipe, a valve between said pipe and auxiliary reservoir, and valves at the ends of the cars, said valves being connected with the contiguous cars, whereby they are automatically closed upon the parting of the cars, substantially as herein described.

THOMAS SAUNDERS.
WILLIAM HENRY PATTON.

Witnesses:
W. B. GRAY,
JOE C. ELWELL.

427 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 22.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Bound Volumes of the Library of this Office of the Complete Specification and Drawings in the matter of the British Letters Patent to Charles Denton Abel, Dated July 14, 1887, Number 9901, for Improvements in Apparatus for Supplying Railway Carriages with Illuminating Gas.

Said Patent received in the Library July 7, 1888.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 3d day of March, in the year of our Lord one thousand nine hundred and eleven and of the independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Date of Application, 14th July, 1887.

Complete Left, 14th Apr., 1888.

Complete Accepted, 18th May, 1888.

A. D. 1887, 14th July, No. 9901.

Complete Specification.

Improvements in Apparatus for Supplying Railway Carriages with Illuminating Gas.

I, Charles Denton Abel, of No. 28 Southampton Buildings, Chancery Lane, in the County of Middlesex, Consulting Engineer, and Patent Agent, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:

428 My invention relates to apparatus for illuminating railway carriages by means of gas and it has for its object to prevent accidental setting fire to surrounding parts of a carriage by ignited gas escaping from a fracture or leakage of any part of the apparatus whether of the conduit pipes, gas holders or gas regulators.

It is based on the discovered fact that the flame from an escape of gas will not set fire to surrounding objects so long as such escape takes place suddenly for a very short space of time.

Thus if the gas holder be fractured and the escaping gas is ignited by sparks from the skidding of the wheels on the rails, or otherwise, the entire volume of gas remaining in the gas holder is made to burn out instantaneously so that the flame which exists only for an exceedingly short space of time will not be capable of igniting surrounding objects. Such ignition only takes place when the gas burns slowly towards the point of escape where it may burn, so that the flame is continuously fed with gas flowing at a moderate pressure.

The desired object is obtained according to the present invention by providing an arrangement by which, in the case of a fracture occurring in any part of the apparatus the gas contained in the intact gas holder is retained in the same; or the gas contained in a second gas holder is prevented from flowing into the first one, in the case where two or more gas holders are connected together and one of these leaks.

For the purpose of this invention an apparatus is combined with the gas holder at that point where the gas is introduced and where it also flows off to the regulator, which apparatus is so arranged as to allow of the entrance of gas at higher pressure from a filling reservoir through the filling valve into the gas holder and also the outflow of the gas holder to the conduit pipes and regulator, if in the latter case the same pressure exists in the gas holder and in the conduit pipes, but which apparatus on the occurrence of a fracture at any part of the conduit pipe or regulator or at one of the gas holders, prevents the issue of gas from the intact gas holders.

At Figs. 1, 2, and 3 of the accompanying drawings is shown the general arrangement of the said apparatus in combination with the gas holder and conduit pipes of a vehicle.

Fig. 1 shews a side view, Fig. 2 a plan, and Fig. 3 an end view. Figs. 4 and 5 shew the application in the case of a vehicle with two gas holders.

The general arrangement of the gas apparatus is well known; A or A^1 A^2 is or are the gas holders, B is the regulator, from which the gas passes at *a* to the separate burners, C^1 C^2 are the
429 charging valves which are temporarily connected to a fixed main gas reservoir for filling the gas holders A, to which gas passes through the pipes *b* b^1. The gas passes from the gas holders A through the pipe *c* to the regulator B, whence it is conveyed to the burner in the usual manner.

The above described safety apparatus is introduced at Z. This apparatus consists either of a disc valve, with or without a spring or of a ball valve or of a flap valve, or of a pivotted slide valve; in both the last named cases the apparatus being also used either with or without a balance weight or spring.

Various constructions may be employed for this purpose, such as those shewn at Figs. 6 to 17. Figs. 6, 7 and 8, and Figs. 11 to 14 shew constructions applicable for a vertical arrangement of the apparatus, while Figs. 9, 10, 15, 16, 17 shew arrangements applicable in any position. In each of these constructions the apparatus inserted at Z Figs. 1 to 5 must fulfil the following functions exactly and with certainty.

1. The valve must open automatically to allow of the inflow of gas at a higher pressure from any filling reservoir, through the filling valve C^1 or C^2 into the gas holder A or A^1 A^2.

2. The valve must open automatically for allowing the gas to issue from the gas holder A through the pipes to the regulator B, when the same pressure exists in the gas holders A or A^1 A^2 and the conduit pipes.

3. The valve must close automatically when any part of the conduit pipes or of the regulator or one of the gas holders when two are used, becomes broken or leaky, in order to prevent the escape of the gas from the intact gas holder.

In the arrangement shewn at Figs. 6 to 8, in which the lower vertical pipe *r* is connected with the gas holder A at Z Fig. 1, the valve is constructed of a hollow cup with spherical surface, which, when the gas holder A is being filled, rests with its lower edge on the seat formed at *g* in the part G of the valve chamber, as shewn at Fig. 6, as the greater pressure of the gas coming from the fixed reservoir holds it down in this position.

When in this position, the openings or notches *s s* formed at the base of the valve S allow the gas to flow from the filling reservoir past it to the gas holder A.

When any part of the conduit pipes or regulator breaks the greater pressure on the side of the valve next the gas holder will cause this to be raised so as to seat against the seating g^1 of the upper part G' of the valve box and thus to automatically close the outlet *a* from the gas holder as shewn at Fig. 8.

430 When the same degree of pressure exists in the conduit pipes and the gas holder A, the valve S falls by gravity on to the seat *g*, thus allowing the gas to pass from the reservoir through the openings *s s* and outlet a^1 as at Fig. 6.

The valve apparatus shewn at Figs. 9 and 10, which may be used in any position, consists of the disc valve T having stems *t* t^1 which slide in guides *f* f^1 having openings, and situated in the valve casing G G^1. Between the faces of the valve T and the guides are placed helical springs F F^1.

With this arrangement when the same pressure exists on either side of the valve, this is held in its middle position as at Fig. 9, in which it leaves the outlet a^1 open, but when there is excess of pressure in the gas holder A this forces the valve against the seat g^1 so as to close the outlet a^1, while when there is greater pressure at a^1 than in the gas holder, as in charging the latter, the valve will be in an intermediate position, establishing the communication between a^1 and the gas holder. Figs. 11 and 12 shew an arrangement in which a ball valve K is used which when there is equal pressure in the gas holder and conduit pipes, falls by gravity on to the support *k* so as to open the outlet a^1 and it will also assume this position when there is greater pressure at a^1 than in the gas holder; when, however the pressure in the latter is the greater, the ball valve will be raised so as to seat against g^1 and thus close the outlet. Figs. 11^a 11^b and 11^c shew an arrangement in which a cone valve K^1 fits with a stem k^0 into the outlet a^1 and has on its underside a rib k^1

by which it rests on the bottom of the chamber G when in the open position, so as to leave a free passage beneath it into the pipe A.

As above stated, the valve may also be arranged as a flap valve or pivotted side; these constructions are shewn at Figs. 13 and 14 and at Figs. 15 and 17. The first named arrangement can only be used in a vertical or slightly inclined position the gas holder being situated above the valve, and the outlet below it, while the arrangement at Figs. 15 to 16 can be used in any position.

The flap valve L of known construction has its seat 1 on the lower part G^1 of the valve casing; but in order to keep the valve open when the pressure is equal in the gas holder and the conduit pipes, it is pressed upward by a pin l^1 guided in the casing and acted upon by a spring l^2 while when a greater pressure exists in the gas holder A, the valve is closed.

In the arrangement shown at Figs. 15, 16, and 17, the opening leading to the gas holder at A is provided with a slide valve D pivotted at d and actuated by means of a lever H connected
431 by a rod i to a piston J. This piston effects the opening of the slide valve D when the pressure is greater in the conduit pipes, on account of its being forced by such pressure into the position shewn at Fig. 15, in which the slide D is open and the gas is enabled to flow from a^1 past the piston J through the small channels i^1 i^1 formed in the sides of the casing J^1, into the gas holder.

When the greater pressure exists in the gas holder, this will force the piston J outwards, thereby closing the slide D and also closing the channels i^1 i^1. The movement of the piston is limited by the pin i^2 with which the lever H comes in contact. When the pressure is equal in the conduit pipes and the gas holder, the spring f^3 acts on the lever H so as to hold the slide D and piston J in the open positions.

It will be readily understood that various other arrangements besides those above described might be devised whereby the essential feature of this invention can be carried into effect, that is to say whereby the communication between the conduit pipes and the gas holder or gas holders, is automatically kept open when the pressure in the former is greater than in the latter, or when the pressure in both is equal, but whereby such communication is closed as soon as the pressure in the gas holder is higher than that in the conduit pipes, so that no gas can escape from the former when the conduit pipes or the regulator or one of the gas holders, when two are used, is or are broken. As proved by experience, should the gas escaping from such fracture or leak become ignited, it will on account of the comparatively small volume of gas at moderate pressure contained in the leaky parts, burn only for such a very short time that there is practically no risk of the fire being communicated to surrounding parts as by the escape the gas will be so rapidly reduced to atmospheric pressure that the supply to the flame will cease almost as soon as this is kindled.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed I declare that what I claim is:

The use in combination with apparatus for illuminating railway carriages with gas, of an automatic safety appliance arranged at the junction of the gas holder or gas holders with the conduit pipes and regulator and with the branch for charging the gas holder or gas holders from a stationary gas reservoir, which apparatus is constructed and operates in such manner that when there is equal gas pressure in the gas holder or gas holders and the conduit pipes or when there is greater pressure in the conduit pipes than in
432 the gas holder or gas holders, the communication between the former and the latter is kept open thereby, but when the pressure in the conduit pipes is less than in the gas holder or gas holders or when the pressure in one gas holder is less than in the second one owing to breakage or leakage, the said appliance automatically closes the communication, substantially as and for the purposes herein described.

Dated this 14th day of April 1888.

ABEL & IMRAY,
Agents for the Appellant.

Fig. 1.

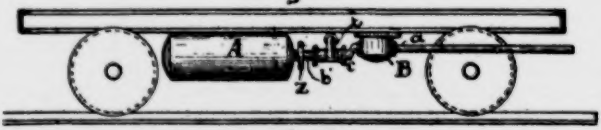


Fig. 2.

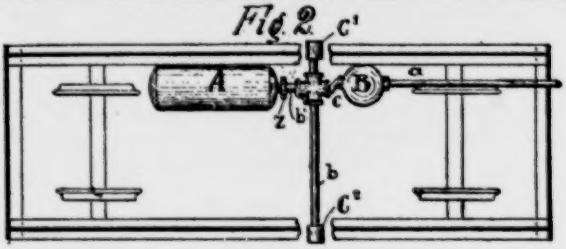


Fig. 4.

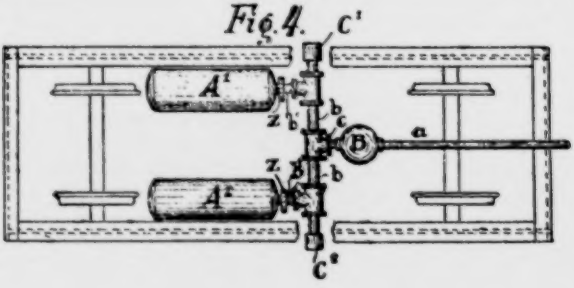


Fig. 5.

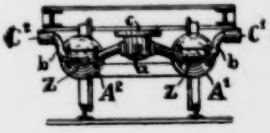
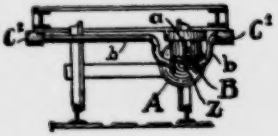


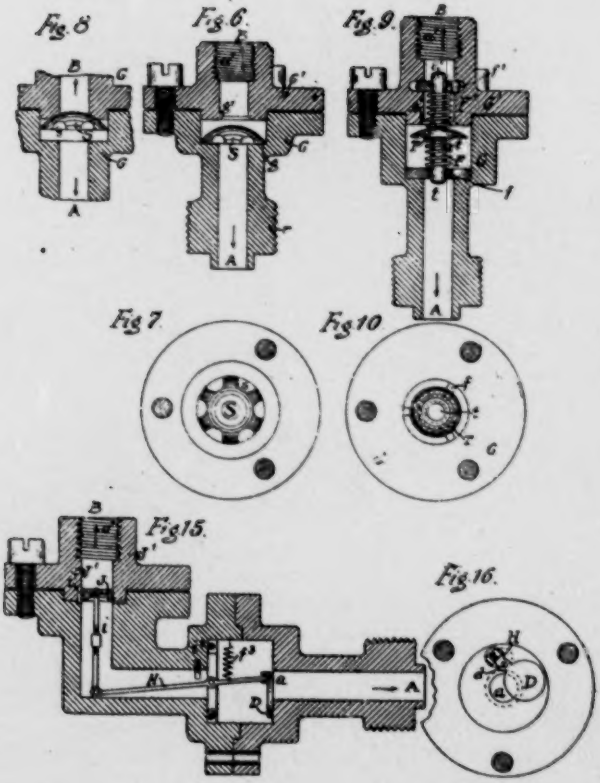
Fig. 3.



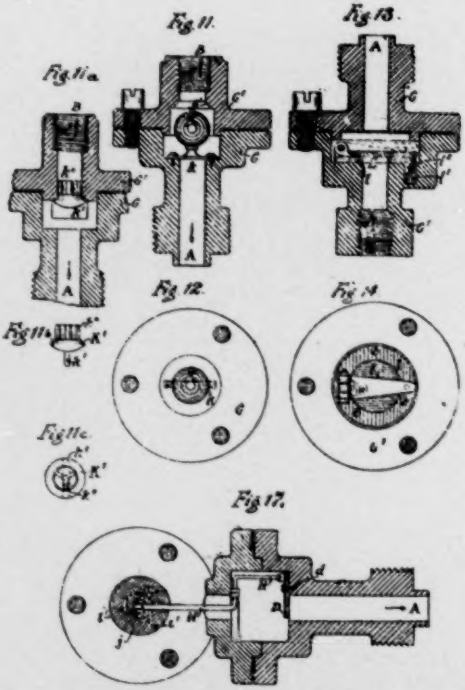
(Here follow drawings marked pages 433 and 434.)

Sheet 2.

514



Sheet 3.



515 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

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516 (Defendant's Exhibit No. 23).

United States of America,

Department of the Interior,

United States Patent Office.

To all to whom these presents shall come, Greeting:

This Is To Certify that the annexed is a true copy from the Records of this Office of the

437 (No Model.)

A. H. J. SCHULKE.

LAMP.

No. 577,989. Patented Mar. 2, 1897.

Fig: 1.

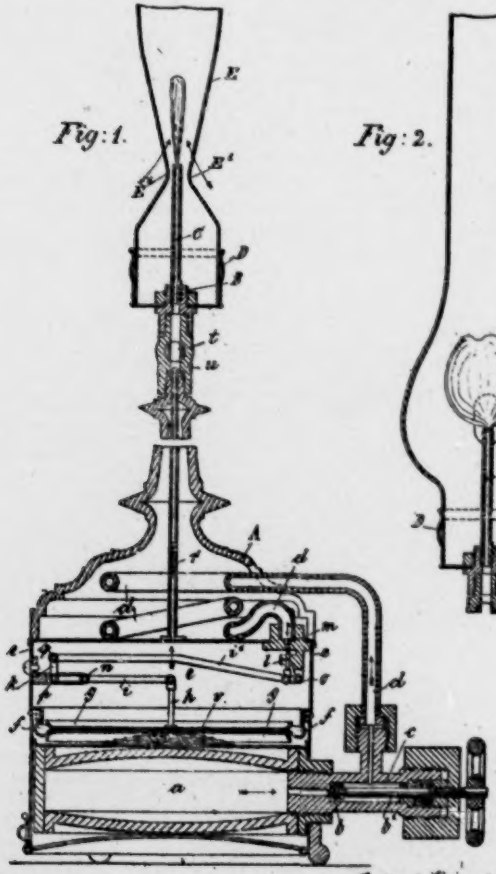


Fig: 2.

Witnesses:
H. van Depenbrock
E. A. Stott

Inventor
August Heinrich Julius Schulke
by Pierce & Co
Attorneys

UNITED STATES PATENT OFFICE. 438

AUGUST HEINRICH JULIUS SCHULKE, OF BERLIN, GERMANY.

LAMP.

SPECIFICATION forming part of Letters Patent No. 577,989, dated March 2, 1897.

Application filed March 21, 1896. Serial No. 584,319. (No model.)

To all whom it may concern.

Be it known that I, AUGUST HEINRICH JULIUS SCHULKE, engineer, a subject of the Emperor of Germany, and a resident of No. 94 Leipzigerstrasse, Berlin, W., in the Empire of Germany, have invented new and useful Improvements in Lamps, of which the following is a full, clear, and exact description.

This invention relates to a lamp fed by heavy hydrocarbons which are stored under high pressure in a chamber in the lamp, or which are passed into the latter at a suitably-reduced pressure, and also embodies an arrangement for feeding the hydrocarbons under certain pressure to the burner for maintaining a regular flame, the latter being caused to spread out by means of two currents of air striking each other in the flame and thus effecting a perfect combustion of the combustible.

I will now describe my invention with reference to the accompanying drawings, in which—

Figure 1 is a vertical section of a lamp provided with a compression-chamber for containing the hydrocarbon under high pressure and having a perforated chimney for admitting air to the flame. Fig. 2 is a section taken at right-angles to Fig. 1 of the burner and chimney.

The chamber *a* containing the hydrocarbon under high pressure is, as shown in the drawings, arranged in the bottom of the lamp. The outlet from the chamber *a* is controlled by a valve *b*, the latter being operated in the casing *c* by a spindle *b'*, provided outside with a wheel or handle. A pipe *d* is suitably screwed onto the casing *c* and after entering the upper part A of the lamp winds spirally within same and is thus flexible.

Between the part A and chamber *a* is arranged a readily-detachable pressure-regulating receptacle *e*, the bottom of which is formed by a diaphragm *f*, made of any suitable flexible material, such bottom being strengthened by a plate or plates *g*, arranged on one or both sides of same.

A spring *v*, the tension of which is made to accord with the required pressure of gas, is arranged between the diaphragm *f* and the top of compression-chamber F, and, in order to equalize the pressure as far as possible, is made very elastic.

In the center of the diaphragm *f* is secured a short rod *h*, to the top of which is linked a double-armed lever *i*, turning on a pivot *n* of a bracket secured to the walls of receptacle *e*. To the second arm at *p* is linked a short arm *k*, and to the latter the long single-armed lever *i'*, which latter turns on pivot *o*. A valve *l*, attached to the lever *i'*, opens and closes the inlet *m* for the hydrocarbon passing through the tube *d*, according as the pressure of the hydrocarbon in the receptacle *e* is greater or less than that exerted by the spring *v* on the diaphragm *f*. The weights of the levers in the receptacle *e* and of the diaphragm *f* are so counterbalanced that an equal pressure is maintained in the receptacle *e* even when the lamp is moved or shook about. The hydrocarbon thus maintained at a constant pressure in the receptacle *e* is fed to the burner through a tube *r* in the top of the receptacle.

The lamp is preferably put out by closing the valve *b* of chamber *a*, the pressure in the receptacle *e* being thereby reduced to the normal atmospheric pressure. A cock *t* may also be arranged in the burner-casing *u* to admit of the light being turned out or lowered at will.

The burner comprises the bored part B, screwed onto the casing *u* and supporting the burner-tube C and closed gallery D for the chimney E. The latter is flattened near the top of the burner-tube C and is provided with openings E', through which the air sucked in impinges against both sides of the flame and thus causes same to spread in the manner shown in Fig. 2. The combustion of the hydrocarbon is thus perfect in every respect.

I prefer to use in my lamp acetylene in a compressed state; but I do not wish to limit myself to this.

Having now fully described and ascertained the nature of this invention, I declare that what I claim, and wish to secure by Letters Patent, is—

1. In combination in a lamp, a chamber *a* in the bottom of the lamp, an upper part A, the pipe *d* leading from the chamber *a* and into the upper casing A, the pressure-cham-

439

ber *e* interposed between the lower chamber *a* and the upper part A, the diaphragm and valve in said chamber *e* with lever connections between them, the burner and the pipe *r* extending from the chamber *e* upwardly through the upper part A, substantially as described.

2. In combination in a lamp, a chamber *a* in the lower part thereof, the upper part A, the pressure-chamber *e* between the lower chamber and the upper part, the flexible tube extending from the chamber *a* and coiled within the upper part A, the diaphragm and valve mechanism in the pressure-chamber *e*, a valve controlling the pipe *d*, the burner and the pipe leading upwardly from the pressure-chamber *e* to the burner, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

AUGUST HEINRICH JULIUS SCHÜLER.

Witnesses:
F. KOLLNER,
W. HAUPT.

(No Model.)

442

E. HILL.

RESERVOIR FOR STORING AND SUPPLYING COMPRESSED AIR.

No. 261,607. Patented July 25, 1882.

Fig. 1.

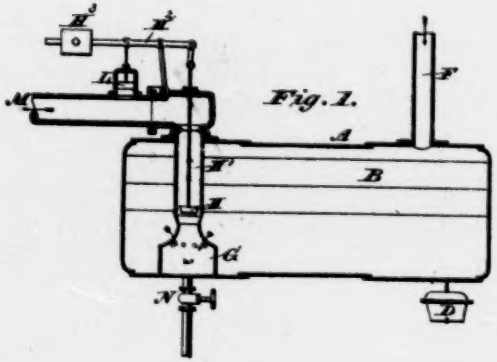
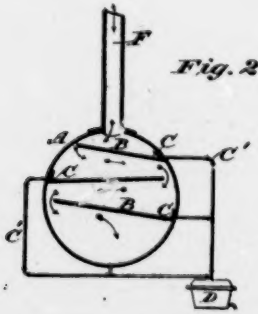


Fig. 2.



WITNESSES:

T. C. Brecht

A. H. Betts

INVENTOR

Ebenezer Hill.

BY Boyd Elliot

EBENEZER HILL, OF SOUTH NORWALK, CONNECTICUT.

RESERVOIR FOR STORING AND SUPPLYING COMPRESSED AIR.

SPECIFICATION forming part of Letters Patent No. 261,607, dated July 25, 1882.

Application filed December 13, 1881. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented new and useful Improvements in Reservoirs for Storing and Supplying Compressed Air, of which the following is a specification.

This invention has for its object the storing, drying, and supplying of air from any of the well-known forms of air-compressors to the machines or apparatus where it is used in such a manner that the highest pressure consistent with the capacity of the compressor and the demands of the machines or apparatus may be uniformly maintained; and the invention consists chiefly in combining a reducing-valve with the reservoir in such a manner as to control, regulate, or govern varying pressures, and to assist in reducing the temperature of the air in the reservoir, so that the moisture will be dropped in its passage to the places for use, as will hereinafter appear.

My invention further consists in providing cooling devices in the reservoir for condensing the moisture, and traps with connections arranged to carry it off, as will hereinafter appear.

In the drawings, Figure 1 represents a side elevation and section of the reservoir and the various devices connected therewith. Fig. 2 is a transverse section and elevation of the same.

At A is represented the reservoir, made sufficiently strong to sustain the maximum pressure required, and it is provided with deflecting-plates B, on the inside, which are slightly inclined and formed with a flange or trough, at C, on the lower edge, to collect and conduct the water of condensation to the outlet-pipes at C', which lead to a trap at D, which is provided with a cock at E, to draw off the water when required. The air from the compressor enters the reservoir at the upper side through a pipe at F, and as it descends strikes the first plate B, and thence over the edge and down over the next plate, and so on, losing more or less water over each plate until it reaches the lower part of the reservoir, where it will be coldest, and will part with all the water due to the reduction of temperature. In this lowest portion of the reservoir is placed the end of the discharge-pipe G, which is perforated with many small holes projecting downward, so that as the air passes out of the reservoir into this pipe it will be forced out around the sharp angles of the holes, and thus tend to "whip out" by the sharp action the last possible mist there may be in the air, and in this condition will pass by the reducing-valve at H in the lower portion of the said pipe. Said reducing-valve is of the well-known form of disk-valve attached to a stem at H', attached to a lever on the outside at H², and balanced by a weight at H³, and said weight is counterbalanced by a piston at L, the stem of which is attached to a lever, H⁴, so that when the pressure on the under side of the piston L is greater than the weight H³ the reducing-valve H will be closed and will remain so closed until the pressure in the discharge-outlet at M is reduced.

Now, with such a construction and arrangement of devices it must be evident, when a number of machines are connected to the discharge-pipe, and the weight on the valve-lever is adjusted to give the proper supply of air, that if any of the machines are stopped the pressure in the discharge-pipe will be increased and the valve at H will be closed, according to the degree of back-pressure upon the reacting piston at L, and consequently the pressure in the reservoir will increase, according to the action of the compressor, and thus the valve performs the double function of a governing and reducing valve, or, as here applied, takes advantage of every decrease in the air-consumption to increase the pressure in the main discharge-pipe and the reservoir before the air reaches the branches that lead to the various machines. One effect of the pressure on the air is to cause it to part with its moisture precisely as the squeezing of water from a sponge; and, as high pressure and low temperature are the factors for producing dry air, this combination of devices secures both cold and dry air to be supplied to the machines.

A tap-cock at N in the lower portion of the reservoir serves to draw off the water of condensation as it may be collected.

I therefore claim—

1. The combination of a reducing and regulating or governing valve and trap with the

444

air-reservoir located between the compressor and the machines or apparatus to be operated by the air, as hereinbefore set forth.

2. The combination of the reservoir, the condensing-plates, and a trap, with intermediate connections, as hereinbefore set forth.

3. The combination of the reservoir with air-outlet pipe having openings from the lower portion thereof into the reservoir, as hereinbefore set forth.

4. The combination of the air-inlet pipe and a reservoir having deflecting-plates with a channel on one edge of each, with pipes leading therefrom and a water-trap, as hereinbefore set forth.

In witness whereof I have hereunto set my hand and subscribed my name and affixed my seal in the presence of two subscribing witnesses.

EBENEZER HILL. [L. S.]

Witnesses:
CHARLES BARTRAM,
EUGENE N. ELIOT.

435 Letters Patent of August Heinrich Julius Schulke, Number 577,989, Granted March 2, 1897, for Improvement in Lamps.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 10th day of January, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

No. 577,989.

THE UNITED STATES OF AMERICA:

To All to Whom These Presents shall come:

Whereas August Heinrich Julius Schulke, of Berlin, Germany, has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Lamps, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and

Whereas upon due examination made the said claimant is adjudged to be justly entitled to a patent under the law;

Now therefore these Letters Patent are to grant unto the said August Heinrich Julius Schulke, his heirs or assigns for the term of seventeen years from the second day of March, one thousand eight hundred and ninety-seven, the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this second day of March, in the year of our Lord one thou-
436 sand, eight hundred and ninety-seven, and of the Independence of the United States of America the one hundred and twenty-first.

JNO. M. REYNOLDS,
Assistant Secretary of the Interior.

Countersigned:
JOHN S. SEYMOUR,
Commissioner of Patents.

G. W. O.
C. S. C.

(Here follow drawings marked pages 437 to 440.)

441 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 24.)

(Here follow drawings marked pages 442 to 444.)

445 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 25.)

(Certified Copy of Provisional and Complete Specifications of British Letters Patent to Claude and Hess No. 29,750.)

Form P, Cert. 1.

Patents and Designs Act, 1907.

It is hereby certified by the Comptroller-General of Patents, Designs, and Trade Marks that on the 24th December, 1896, Georges Claude (Engineer) of 2 Rue de Bérulle, Saint Mandé (Seine) France, and Albert Hess (Engineer) of 46, Rue Notre Dame de Lorette, Paris, France, made an application (with provisional specification) for a Patent for an invention the title of which is "An improved method of storing acetylene for lighting and other purposes"; that the application in question was numbered 29750 of 1896; that under the provisions of Section 103 of the Patents, Designs and Trade Marks Act, 1883, the date 30th June, 1896, was claimed for the said application being the date of an application for a Patent in France; that a complete specification was left in connection with the said application on the 8th September, 1897; that the said complete specification was accepted on the 24th December, 1897; that a Patent was granted in respect of the said application on the 15th March, 1898, and sealed as of the 30th June, 1896; and that the Patent in question expired on the 30th June, 1900, through failure to pay the prescribed renewal fee due in respect thereof on that date. It is also certified that the annexed are true copies of the said provisional and complete specifications.

Witness my hand this 2nd day of February, 1911.

[SEAL.] W. TEMPLE FRANKS,
Comptroller-General of Patents, Designs, and Trade Marks.

Consulate-General of the United States of America for Great Britain and Ireland at London.

I, John L. Griffiths, Consul-General of the United States of America for Great Britain and Ireland at London, do hereby make known and certify to all whom it may concern, that the signature "W. Temple Franks" subscribed to the annexed Certificate, is of the true and proper handwriting of Comptroller-General of Patents, Designs and Trade Marks, London, England, that the seal
446 affixed to the said Certificate is the seal of the Patent Office, London, England, and that to all acts signed as the annexed full faith and credit are and ought to be given in Judicature and thereout.

In testimony whereof I have hereunto set my hand and affixed

the Seal of the Consulate-General of the United States at London, aforesaid, this 6th day of February, 1911.

[SEAL.] JOHN L. GRIFFITHS,
Consul-General.

Consulate General, 6 Feb., 1911, U. S. A., London.
American Consular Service. $2 Fee Stamp.

I Certify this to be a true copy.

[SEAL.] H. HATFIELD,
Acting for Comptroller.

(Second Edition.)

No. 29750. A. D. 1896.

(Under International Convention.)

Date Claimed for Patent under Sect. 103 of Act, Being Date of First Foreign Application (in France), 30th June, 1896.

Date of Application (in the United Kingdom), 24th Dec., 1896.

Complete Specification Left, 8th Sept., 1897; Accepted, 24th Dec., 1897.

Provisional Specification.

"An Improved Method of Storing Acetylene for Lighting and Other Purposes."

We, Georges Claude, of 2, rue de Berulle, Saint Mande (Seine), France, Engineer; and Albert Hess, of 46, Rue Notre Dame de Lorette, Paris, France, Engineer; do hereby declare the nature of this Invention to be as follows:

This invention relates to an improved method of storing acetylene for lighting and other purposes in a small volume in order that it may be supplied in portable form to the consumer and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene and so enable a considerable quantity of acetylene to be stored in a small volume in readiness to be supplied for any purpose for which it may be required.

447 Liquefied acetylene occupies the least volume but the pressure is very high and may become excessive should the critical tmperature (37°.5) of acetylene be accidentally exceeded. On the other hand simple compression of the gas enables dangerous pressures to be avoided, but the quantity which can be stored in this way is too small. For these reasons we avail ourselves of the great solubility of acetylene in certain liquids, and increase this solubility by pressure and this method of storing acetylene gas is the Invention

which we hereby broadly claim as our Invention whatever may be the liquid employed, the kind of apparatus used, or mode of operation.

As examples of the liquids which may be employed for the purpose may be mentioned methylic, ethylic, amylic, and other alcohols, acetic acid, benzine, toluene, xylene, etc. Certain of these liquids dissolve, according to the conditions of temperature, from four to upwards of six times their volume of acetylene at the ordinary pressure and this solubility increases about as the pressure. There are however certain well defined chemical groups of substances which are unsuitable for the purpose, owing to absence or insufficiency of solvent power, namely:—Primary, secondary, tertiary, amines of the fatty series as well as phosphines and arsenious derivatives.

di-hydroxyl alcohols (glycols).

tri-hydroxyl alcohols (glycerine) and their chlorine derivatives.

Solutions of polyhydroxyl alcohols (sugars).

The higher members of the fatty acid series (oleic acid, oils).

Amidic acids of the fatty series (glycocoll).

Russian petroleums.

The derivatives of cyanogen other than hydrocyanic ethers.

Pyridic and quinoleic bases.

Chlorine, bromine, iodine, and their oxygen derivatives, hydrochloric, hydrobromic, and hydriodic acids.

Oxygen derivatives of nitrogen.

Oxygen derivatives of sulphur (sulphuric acid, etc.).

Solutions of metallic oxides.

Solutions of alkali salts and alkali-earth salts (potassium, sodium, lithium, barium, etc.).

Solutions of salts of magnesium, zinc, iron, nickel, cobalt, manganese, chromium, copper, lead, etc.

Solutions of metallic chromates and bi-chromates, manganates, and permanganates.

The exclusion of the substances comprised in the above classification confine the list of substances which may be used, within well defined limits. But certain of the substances which may be used, surpass their congeners, for instance methyl formate, acetal, 448 ethylic aldehyde, acetate of ethyl, oxalic ether, acetone, succinic ether, butyrate of isobutyl, acetate of amyl, methylallyl, methylic alcohol. These bodies are merely given as examples and we do not limit ourselves thereto, or to their mixtures or combinations.

Between these two limits of substances which are unsuitable and those having a marked superiority as regards their solvent and other qualities, there is a whole series of bodies which may be used, but with less advantage. The bodies which have as yet been found to answer the purpose in practice are comprised in the following groups:—

In the fatty series liquid hydrocarbons, acetylenic hydrocarbons, and their derivatives, alcohols, ethers, the lower members of the acid and oxy-acid aldehydes, and particularly acetones.

In the aromatic series benzinic hydrocarbons and their derivatives, phenols, aromatic amines.

In the higher series liquid hydrocarbons and their known derivatives, tri-methylene, furfurine, thiophenol, pyrrol, furfurol, essences, etc.

Mixtures and combinations of these bodies vary their solvent power and in certain cases we avail ourselves of this property.

With a pressure about equal to that used in a soda-water syphon we are able to store a considerable volume of acetylene in a receiver of relatively small dimensions. With a liquid dissolving m times its volume of acetylene, we can thus store at equal pressure about m times more gas than if it were simply compressed without being dissolved in a liquid, which is the principle of our Invention.

When gas is withdrawn from a receiver containing a solution of acetylene under pressure, the pressure necessarily falls constantly, and to obtain a regular supply of gas we provide the vessel with a pressure regulator. The process may be carried out as follows, for instance, although subject to modifications.

The acetylene is dissolved in the liquid chosen, by the means ordinarily employed in making soda-water, the solution of the gas being facilitated by agitation under pressure in contact with the liquid. The solution under pressure, however, obtained, is filled into a receiver of metal or of glass (such as used for soda-water) capable of resisting the pressure employed. The receiver has a cock and the necessary adjuncts for connection, directly or through an expansion chamber, with the appliances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected.

The storage receivers may vary in dimensions from a small portable, to a large fixed, gas-holder.

Dated this 24th day of December 1896.

A. M. & WM. CLARK.

449 *Chartered Patent Agents,* 53 *Chancery Lane, London.*

Complete Specification.

"An Improved Method of Storing Acetylene for Lighting and Other Purposes."

We, Georges Claude, of 2, rue de Berulle, Saint Mande (Seine), France, Engineer; and Albert Hess, of 46, Rue Notre Dame de Lorette, Paris, France, Engineer, do hereby declare the nature of this Invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement:—

This Invention relates to an improved method of storing acetylene, for lighting and other purposes, in a small volume in order that it may be supplied in portable form to the customer, and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene and so enable a considerable quantity of acetylene to be stored

in a small volume in readiness to be supplied for any purpose for which it may be required.

Liquefied acetylene occupies the least volume but the pressure is very high and may become excessive should the critical temperature (37°.5) of acetylene be accidentally exceeded. On the other hand simple compression of the gas enables dangerous pressures to be avoided, but the quantity which can be stored in this way is too small. For these reasons we avail ourselves of the great solubility of acetylene in certain liquids, and increase this solubility by pressure, and this method of storing acetylene gas is the Invention which we hereby broadly claim as our Invention, whatever may be the liquid employed, the kind of apparatus used, or mode of operation.

As examples of the liquids which may be employed for the purpose may be mentioned methylic, ethylic, amylic, and other alcohols, acetic acid, benzene, toluene, xylene, etc. Certain of these liquids dissolve, according to the conditions of temperature, from four to upwards of six times their volume of acetylene at the ordinary pressure and this solubility increases about as the pressure. There are however certain well defined chemical groups of substances which are unsuitable for the purpose, owing to absence or insufficiency of solvent power, namely:—

Primary, secondary tertiary amines of the fatty series as well as phosphines and arsenious derivatives.

di-hydroxyl alcohols (glycols).

tri-hydroxyl alcohols (glycerine) and their chlorine derivatives.

Solutions of polyhydroxyl alcohols (sugars).

450 The higher members of the fatty acid series (oleic acid, oils).

Amidic acids of the fatty series (glycocoll).

Russian petroleums.

The derivatives of cyanogen other than hydrocyanic ethers.

Pyridic and quinoleic bases.

Chlorine, bromine, iodine, and their oxygen derivatives, hydrochloric, hydrobromic, and hydriodic acids.

Oxygen derivatives of nitrogen.

Oxygen derivatives of sulphur (sulphuric acid, etc.).

Solutions of metallic oxides.

Solutions of alkali salts and alkali-earth salts (potassium, sodium, lithium, barium, etc.).

Solutions of salts of magnesium, zinc, iron, nickel, cobalt, manganese, chromium, copper, lead, etc.

Solutions of metallic chromates and bi-chromates, manganates, and permanganates.

The exclusion of the substances comprised in the above classification confine the list of substances which may be used, within well defined limits. But certain of the substances which may be used, surpass their congeners, for instance methyl formate, acetal, ethylic aldehyde, acetate of ethyl, oxalic ether, acetone, succinic ether, butyrate of isobutyl, acetate of amyl, methylallyl, methylic alcohol. These bodies are merely given as examples and we do not limit ourselves thereto, or to their mixtures or combinations.

Between these two limits of substances which are unsuitable and those having a marked superiority as regards their solvent and other qualities, there is a whole series of bodies which may be used, but with less advantage. The bodies which have as yet been found to answer the purpose in practice are comprised in the following groups:—

In the fatty series liquid hydrocarbons, acetylenic hydrocarbons, and their derivatives, alcohols, ethers, the lower members of the acid and oxy-acid aldehydes, and particularly acetones.

In the aromatic series benzenic hydrocarbons and their derivatives, phenols, aromatic amines.

In the higher series liquid hydrocarbons and their known derivatives, tri-methylene, furfurine, thiophenol, pyrol, furfurol, essences, etc.

Mixtures and combinations of these bodies vary their solvent power and in certain cases we avail ourselves of this property.

With a pressure about equal to that used in a soda-water syphon, we are able to store a considerable volume of acetylene in a receiver of relatively small dimensions. With a liquid dissolving m times its volume of acetylene, we can thus store at equal pressure about m times more gas than if it were simply compressed without being dissolved in a liquid, which is the principle of our Invention.

451 When gas is withdrawn from a receiver containing a solution of acetylene under pressure, the pressure necessarily falls constantly, and to obtain a regular supply of gas we provide the vessel with a pressure regulator. The process may be carried out as follows, for instance, although subject to modifications:

The acetylene is dissolved in the liquid chosen, for instance by the means ordinarily employed in making soda-water, the solution of the gas being facilitated by agitation under pressure in contact with the liquid. The solution under pressure, however obtained, is filled into a receiver of metal or of glass (such as used for soda-water) capable of resisting the pressure employed. The receiver has a cock and the necessary adjuncts for connection, directly or through an expansion chamber, with the appliances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected.

The storage receivers may vary in dimensions from a small portable, to a large fixed, gas-holder.

Having now particularly described and ascertained the nature of the said Invention and in what manner the same is to be performed we declare that what we claim is:—

1. The utilization for the purpose of storage, in a small volume, of large quantities of acetylene gas, of the solubility of said gas in certain liquids by the application of pressure so as to increase the quantity of gas dissolved per unit of volume of liquid as specified.

2. The novel application as solvents of acetylene under pressure for the purpose of storage, transport, and utilization for industrial purposes, of the bodies contained in the following groups belonging to the fatty series:—liquid hydrocarbons, acetylene hydrocarbons, and the chloro, bromo, iodo, and nitro derivatives of said hydrocar-

bons as well as the lower members of the acids and oxy-acids and their solutions; aldehydes, mono-hydroxyl alcohols and unsaturated alcohols of the fatty series; ethers (oxides, cyanides, cyanates).

3. The novel employment as solvents of acetylene under pressure for the purposes of storgae, transport, and industrial utilization, of the following groups of bodies belonging to the aromatic series:—benzenic hydrocarbons (benzene, toluene, xylene, etc.), chloro, bromo, iodo, and nitro derivatives of said hydrocarbons, phenols, aromatic amines (aniline, toluidine, etc.).

4. The novel application as solvents of acetylene under pressure for the purposes of storage, transport, and industrial utilization, of the following groups of bodies belonging to the higher
452 series:—liquid hydrocarbons and their derivatives (trimethylene, furfurine, thiophenol, pyrrol, furfurol, essences, etc.).

5. The application, for the same purpose, of mixtures or combinations of the bodies specified.

6. The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified.

7. The herein described method of storing acetylene gas in a small volume for lighting or other purposes, which consists in dissolving the acetylene gas under pressure in a suitable liquid solvent such as described from which it can be evolved when required for use.

Dated this 8th day of September, 1897.

A. M. & WM. CLARK,
Chartered Patent Agents, 53, Chancery Lane, London.

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(Wt. 57—25/9/1910.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANT'S EXHIBIT No. 26.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed are true copies of Certified copies, in the Library of this Office, of the Specification; Certificate of Addition dated March 20, 1897; and Certificate of Addition dated October 15, 1897; in the matter of French Letters Patent to Claude (Georges) and Hess (Albert), dated June 30, 1896, Number 257,679, pour un système d'emmagasinement de l'acétylène.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 16th day of February, in the year of our Lord one thou-
453 sand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Assistant Commissioner of Patents.

République Française.

Ministère du Commerce et de L'Industrie.

Conservatoire National Des Arts et Métiers.

Office National De La Propriété Industrielle.

Copie officielle

d'un Brevet d'Invention délivré sous le No. 257,679.

Mémoire Descriptif annexé au Brevet d'Invention de quinze aus pris, le 30 juin 1896, par M. M. Claude (Georges) et Hess (Albert), à Paris, 46, rue Notre Dame-de-Lorette, et qui leur a été délivré par arrêté du Ministre du Commerce, de l'Industrie, des Télégraphs en date du 19 Octobre 1896 pour un système d'emmagasinement de l'acétylène.

Le present brévet a pour object un système d'emmagasinement de l'acétylène permettant de renfermer sous un volume restreint et de transporter aisément l'acétylène applicable à un usage quelconque et en particulier a l'éclairage.

Pour employer dans la pratique l'acétylène, on peut transporter chez le consommateur soit l'acétylène lui-même, soit le carbure da calcium destiné à le produire. Le premier procédé nous paraît actuellement le plus rationnel; pour le mettre en pratique, on a proposé jusqu' à ce jour l'emploi de l'acétylène liquéfié.

Nous avons recourse à un autre moyen qui fait l'objet du présent brevet et qui consiste à utiliser la solubilité de l'acétylène dans certains liquides et l'augmentation de cette solubilité avec la pression: on emmagasine ainsi sous un volume restreint une quantité assez considérable d'acétylène pouvant être utilisé ultérieurement à mesure des besoins. Les quelques explications suivantes justifieront cette méthode d'emmagasinement.

C'est évidemment sous la forme de produit liquéfié que l'acétylène occupé le moindre volume, mais les pressions sous lesquelles se trouve alors le gaz sont trés considérables et peuvent atteindre des valeurs énormes si la température critique (3705) de l'acétylène est depassée pour une cause accidentelle quelconque.

L'emploi du gaz simplement comprimé d'autre part, permettrait de se limiter [de se limiter] à des pressions moindres, mais la quantité d'acêtylène ammagasinée de cette façon par unité de vol-
454 ume est trop faible pour justifier l'adoption de ce procédè, pour l'éclairage domestique notamment. En effet, chaque litre de gaz à la pression de n atmosphères ne correspondrait qu'an litres une fois détendue.

Ces raisons nous ont fait songer à utiliser la solubilité de l'acétylène très grande dans certains liquides, et l'augmentation de cette solunilité avec la pression.

L'objet du présent brevet est de nous réserver expressèment l'application de ce principe a l'emmagasinement du gaz acétylène, quels

que soient d'ailleurs les liquides employés, quelle que soit la forme donnée aux appareils, quelque soit enfin le mode opératoire.

Nous citerons parmi les liquides qu'il est possible d'employer dans ce but, et simplement à titre d'exemple, les divers alcools, méthylique éthlique, amylique et autres, l'acide acétique, la benzine, le toluène, le xylène, etc. Certains de ces liquides dissolvent, selon les conditions de température, de 4 à plus de 6 fois leur volume d'acétylène à la pression ordinaire, et cette solubilité augmente à peu de chose prés aussi rapidement que la pression.

Avec une pression sensiblement èquivalente à celle que l'on emploie dans les siphons d'eau de Seltz, nous pouvons ainsi emmagsiner dans un récipient de volume relativement petit un volume très considérable d'acétylène.

Avec un liquide dissolvant m fois son volume d'acétylène, nous emmagasinons ainsi, à pression égale, environ m fois plus de gaz, que si l'on comprimait simplement celui-ci sans faire intercenir le principe de la dissolution dans les liquides, principe dont nous revondiquons l'application à cet égard.

Lorsque d'un récipient contenant une solution d'acétylène sous pression on extrait le gaz, la pression va nécessairement on s'abaissunt constamment. Quand nous voulons obtenir un débit régulier du gaz, comme il est nécessaire par exemple pour l'éclairage, nous munissons ce récipient d'un détendeur d'une disposition convenable. Nous indiquerons ci-après comment on peut réalizer pratiquement le procédé dont nous venons d'indiquer le principe; ce mode de réalisation, cité seulement à titre d'exemple, peut subir des modifications variées.

La solution d'acétylène dans le liquide choisi est réalise par les moyens habituels employés par exemple dans l'industrie de l'eau de Seltz, dans lacquelle la dissolution du gaz est favorisée par son agitation sous pression au contact du liquide. La dissolution sous pression obtenu par ce moyen ou tout autre remplit un réservoir métallique (ou en verre, comme pour les siphons d'eau de Seltz) susceptible de résister à la pression employée.

455 Le recipient est muni d'un robinet et des accessoires nécessaires pour être mis en communication, directement ou par l'intermédiaire d'un détendeur, avec l'appareil d'utilisation se trouvant chez le consommateur.

Dans ces conditions, la substitution des appareils chargés aux récipients épuisés s'effectue avec facilité sans que le consommateur ait en rien à se préoccuper de la fabrication du produit qu'il utilise.

Il concient de remarquer enfin que les appareils n'ayant pasdedimensions limitées, peuvent presénter une capacité d'emmagasinement quelconque et être employés non seulement comme réservoirs portaifs mais aussi comme gazométres fixes.

En désumé, nous revendiquons comme faisant partie du présent brevet et comme étant notre propriété exclusive:

1e. L'application, pour l'emmagasinement sous faible volume de grandes quantités d'acétylène, de la solubilité de ce gaz dans certains liquides en faisant internenir la pression, de maniére à augmenter

la quantité de gaz dissous par unité de volume du liquide conformément à la description ci-dessus;

2e. L'empoli, dans le but de réaliser la dissolution sous pression de grandes quantités d'acétylène dans un petit volume de liquide, des méthodes et appareils usités pour obtenir la dissolution sous pression d'autres gaz dans d'autres liquides, notamment de l'acide carbonique dans l'eau.

Paris, le 27 juin, 1895.

(Signé) G. CLAUDE ET A. HESS.

Trois rôles et demi collationnés; un mot nul.

PARIS, le 26 Nov., 1907.

Pour expédition certifiée conforme Le Sécretaire général de l'Office National de la Propriété Industrielle. Brobbe Conservatoire National Des Arts et Metiers. Office National de la Propriété Industrielle.

456 *Translation.*

République Française.

Official National de la Propriété Industrielle.

Official Copy of a Patent Issued under No. 257,679.

Descriptive Memorandum annexed to the fifteen-year patent taken out on the 30th of June, 1896, by Messrs. Georges Claude and Albert Hess, Paris, 46 Rue Notre-Dame-de-Lorette, and delivered to them by order of the Minister of Commerce, Industry, Posts and Telegraphs, on the 19th of October, 1896, for a System of Storing Acetylene.

The object of this invention is a system of storing acetylene, whereby acetylene to be used for any purpose whatsoever, especially for lighting, may be enclosed in a restricted space and easily transported.

In order to use acetylene for practical purposes, either the acetylene itself or calcium carbide designed to produce it may be transported to the consumer's house. The former method seems to us to be the more rational. To carry it into execution the use of liquefied acetylene has heretofore been proposed.

We resort to another means, which forms the subject of this patent and which consists in utilizing the solubility of acetylene in certain liquids and increasing such solubility by pressure. It thereby becomes possible to store in a restricted space a large quantity of acetylene, which can then be used as may be required.

The few explanations which follow will justify this method of storage.

It is obvious that acetylene occupies the least space in the lique-

(F. P. 257,679.)

fied state, but the pressures to which the gas is subjected in that case are very high and may attain enormous values if the critical temperature of acetylene (37.5°) is exceeded from any accidental cause.

By the use of merely compressed gas, on the other hand, it would become possible to confine one self to lower pressures, but the quantity of acetylene stored in this manner per unit of volume is too small to justify the adoption of this process, especially for lighting houses. As a matter of fact, each liter of gas at a pressure of n atmospheres would not correspond to n liters after expanding.

These reasons have suggested to us to take advantage of the solubility of acetylene, which is very high in certain liquids, and of the increase of such solubility by pressure.

457 The object of this patent is to reserve expressly to ourselves the application of this principle to the storage of acetylene gas, whatever may be the liquids employed, whatever form be given to the apparatus and whatever may be the mode of operation.

Among the liquids susceptible of being used for this purpose we will mention, merely as an illustration, the different alcohols—methylic, ethylic, amylic, and others—, acetic acid, benzene, toluene, xylene, etc. Some of these liquids dissolve, according to the conditions of temperature, from 4 to over 6 times their volume of acetylene at normal pressure, and such solubility increases almost as rapidly as the pressure.

With a pressure practically equivalent to that which is used in Seltzer water syphons we are thus enabled to store a very large volume of acetylene in a recipient of comparatively small volume.

(F. P. 257,679.)

With a liquid which dissolves m times its volume of acetylene we thus store, at the same pressure, about m times more gas than if the latter were merely compressed without applying the principle of solution in liquids, the application of which principle for this purpose we claim for ourselves.

When from a recipient containing an acetylene solution under pressure the gas is abstracted, the pressure will necessarily decrease constantly. When we wish to secure a regular supply of gas, such as is necessary, e. g., for lighting purposes, we fit the recipient with an expander of suitable construction. We will show below how the process of which we have stated the principle may be carried out; such application, given merely as an illustration, may undergo various modifications.

The solution of the acetylene in the liquid chosen is effected by the usual means employed in the Seltzer water industry, for instance, in which the solution of the gas is aided by its being agitated under pressure upon contact with the liquid. The solution under pressure obtained by this means, or by any other means, is placed

in a metal recipient (or a glass recipient, like the seltzer water siphons) susceptible of resisting the pressure employed.

The recipient is provided with a faucet and the necessary fittings to enable it to be connected, either directly or by means of an expander, with the apparatus of consumption at the house of the consumer.

Under these circumstances the substitution of charged recipients for empty ones is accomplished very easily, without the consumer having to trouble about the manufacture of the product which he uses.

458 (F. P. 257,679.)

It should be stated in conclusion that the apparatus, not being limited as to dimensions, may be made of any storage capacity and used not only in the shape of portable recipients but also as stationary gasometers.

To sum up, we claim, as forming part of this patent and as being our exclusive property:

1. For the storage of large quantities of acetylene in a small space, the application of the solubility of this gas in certain liquids, using pressure for the purpose of increasing the amount of gas dissolved per unit of volume of the liquid, as described above;

2. For the purpose of effecting the solution under pressure of large quantities of acetylene in a small volume of liquid, the use of methods and apparatus employed to cause the solution under pressure of other gases in other liquids, especially of carbonic acid in water.

Paris, June 27, 1896.

(Signed) G. CLAUDE AND
A. HESS.

(The correctness of the copy from which this translation is made is attested by the "Secrétaire général del l'Office National de la Propriété Industrielle"— the head of the French Patent Office—by his signature and the seal of said Office.)

N. E. K.
2-11-11.

République Française.

Ministére du Commerce et de L'Industrie.

Conservatoire National des Arts et Méttiers.

Office National de la Propriété Industrielle.

Copie Officielle d'un Certificat d'Addition au Brevet d'Invention N° 257,679.

Memoire Descriptif annexé au Certificat d'Addition pris, le 20 mars 1897, par la Compagnie Francaise de l'Acétylène dissous, représentée par M. Delom, à Paris, 58 bis rue de la Chausés d'Antin, et se rattachant au brevet d'invention de quinze ans pris, le 30 juin 1896, par M. M. Claude et Hess, pour un système d'emmagasinement de l'acétylène.

459 Ledit certificat d'addition a été délivré par arrêté du Ministre du Commerce, de l'Industrie, des Postes et des Télégraphes en date du 2 juillet 1897.

Dans notre brevet du 30 juin 1896, nous avons revendiqué un procédé d'emmagasinement de l'acétylène par dissolution sous pression dans certains liquides.

Ces liquides ont été enoncés en détail dans le certificat d'addition du 2 novembre 1896.

Pour faciliter la dissolution du gaz ainsi que son dégagement, pour permettre le remplissage complet des récipients et pour procurer des facilités de transport, nous avons deconnu qu'il était, dans certains cas, avantageux de mélanger le liquide avec un corps poreux capable de l'absorber. A titre d'exemples non limitatifs de corps pouvant servir pour cette application, nous indiquerons la pierre ponce, la silice dans ses différents états et notament dans eclui où elle est employée pour la fabrication de la dynamite, la sciure de bois, le charbon sous ses diverses formes, l'alumine, les produits céramiques, etc.

Nous revendiquerons donc comme notre perfectionnement, la combinaison des divers liquides capables de dissoudre l'acétylène, avec un corps poreux capable d'absorber ces liquides, le tout destiné à emmagasiner l'acétylène par dissolution sous pression.

Paris, le 20 mars 1897.

p pon de la C^ie^ Francaise de l'Acétylène dissous.

(Signé) GEORGES DELOM.

Un rôle et demi collationnés.

< PARIS, le 26 Nov. 1907.

Pour expédition certifiée conforme Le Secrétaire général de l'Office National de la Propriété Industrielle Robbe Conservatoire
7 National Des Arts et Métiers. Office National de la Propriété Industrielle.

Translation.

République Française.

Office National de la Propriété Industrielle.

460 *Official Copy of a Certificate of Addition to Patent No.* 257,679.

Descriptive Memorandum Annexed to the Certificate of Addition taken out on the 20th of March, 1897, by the Compagnie Française de l'Acétylène dissous, represented by Mr. Delom, Paris, 58 bis rue de la Chaussée d'Antin, and referring to the fifteen-year patent taken out on the 30th of June, 1896, by Messrs. Claude and Hess, for a system of Storing Acetylene.

Said Certificate of Addition was delivered by order of the Minister of Commerce, Industry, Posts and Telegraphs on the 2d of July, 1897.

In our patent of June 30, 1896, we claimed a process of storing acetylene by solution under pressure in certain liquids.

Such liquids were enumerated in detail in the Certificate of Addition of November 2, 1896.

We have found that, in order to facilitate the solution of the gas as well as its evolution, to enable the recipients to be completely filled and to secure facilities of transportation, it was in certain cases of advantage to mix the liquid with a porous body capable of absorbing it. As illustrations not intended to limit the bodies which may be used for this purpose, we will mention pumice stone, silica in its different states, especially in the state in which it is employed in the manufacture of dynamite, saw dust, carbon (coal) in its different forms, aluminum, keramic products, etc. We claim therefore as our improvement the combination of various liquids capable of dissolv-

(F. P. 257,679, 1st Cert. of Add'n.)

ing acetylene with a porous body capable of absorbing such liquids, all to the end of storing acetylene by solution under pressure.

Paris, March 20, 1897.

By power of attorney from the C^ie^ Française de l'Acétylène dissous.

(Signed) GEORGES DELOM.

(The correctness of the copy from which this translation is made is attested by the "Secrétaire général de l'Office National de la Propriété Industrielle"—the head of the French Patent Office by his signature and the seal of said Office.)

N. E. K.
2-11-11.

461 République Française.

Ministère Du Commerce Et De L'Industrie.

Conservatoire National Des Arts Et Métiers.

Office National De La Propriété Industrielle.

Copie Officielle d'un Certificat d'addition au Brevet d'Invention N° 257,679.

Mémoire Descriptif annexé au Certificat d'addition pris, le 15 octobre 1897, par la Compagnie Française de l'Acétylène dissous, représentée par M. Josse, à Paris, rue de Chausée d'Antin, N° 58 bis et se rattachant au brevet d'invention de quinze ans pris, le 30 juin 1896, par M. M. Claude et Hess, pour un systeme d'emmagasinement de l'acétylène.

Ledit certificat d'addition a été délivré par arrêté du Ministre du Commerce, de l'Industrie, des Postes et des Télégraphes en date du 1er février 1898.

Les Perfectionnements que nous àvons apportés dans la mise en oevre de notre procédé onto pour but de faciliter et d'améliorer pour certains applications l'absorption de l'acétylène dans les liquides destinés a l'emmagasiner—que cette absorption soit produite par une simple dissolution on une sorte de combinaison, ce qu'il est malxisé de déterminer et ce que nous n'avons d'ailleure pas à expliquer ici.

Nous avons constaté que cette absorption peut étre excitée dans certains cas par l'addition au liquide dissolvant, de corps capables de se mélanger ou de se combiner avec lui ou de s'y dissoudre. Ces corps additionnels peuvent être bien entendu solides, liquides ou gazeux.

Nous revendiquons donc, comme notre propriété, cette méthode qui n'est qu'un développement de l'invention primitive.

Nous indiquerons mais seulement à titre d'exemple, la combinaison suivante:

Dans 100 centimetres cubes d'alcool éthylique on fait préalablement dissoudre 10 grammes d'oxyde de méthyle. Ce mélange jouit de la propriété de dissoudre deux fois plus d'acétylène que n'en peut dissoudre l'alcool éthylique seul.

462 Pour préparer l'acétylène comprimé ou liquéfié un procédé trés simple consiste à enfermer dans un récipient hérmetiquement clos du carbure de calcium et de l'eau. Nous revendiquons, comme développement de notre invention primitive la combinaison de ce système avec l'emploi des liquides dissolver ts, combinaison qui consiste, par exemple, à mettre simultanément, dans le récipient hermétique du carbure de calcium, de l'eau et de l'acétone, en proportions convenables, ainsi:

40 grammes de carbure de calcium.
40 centimètres cubes d'eau.
60 centimètres cubes d'acétone.

L'acétylène produit par la réaction de l'eau sur le carbure se dissout dans l'acétone au fur et à mesure de sa production, et l'on arrive ainsi à accumuler des quantités relativement importantes de ce gaz, sous une pression beaucoup plus faible que celle que l'on aurait atteinte sans l'addition de l'acétone.

C'est là une application de notre moyen général.

Nous avons déjà dans une précéndente addition indiqué l'emploi de matières solides poreuses ou pulvérulentes, destinées à encombrer complétement le volume intérieur des récipients, et à absorber le liquide dissolvant qui ne peut plus ni ballotter dans le transport, ni se répandre en cas de rupture.

Nous allons indiquer ici une forme advantageuse et pratique d'appliquer ce dispositiff.

Le matière poreuse est constituée par une série de briques céramiques très légères, que l'on ajuste exactement et que l'on superpose dans le récipient de façon à le remplir en entier sans laisser aucun vide. Ces briques ont été au préalable percées de part en part d'un grand nombre de trous très fins (1 m/m de diamétre par exemple). L'acétone, ou tout autre liquide dissolvant, est répandu sur ces briques en quantité suffisante pour les inpregner sans toutfois qu'il reste aucun excès de liquide dans les perforations. Si maintenant, dans un récipient ainsi préparé, on vient à comprimer de l'acétylène, ce gaz se répand dans toute la masse grâce aux perforations restées libres, et se dissout rapidement dans l'acétone qui imprègue la matière céramique. Inversement, quand on veut utiliser le gaz accumulé, le dégagement se fait avec la plus grande régularité.

463 Enfin la solidité de la brique empêche qu'il se produise des tassements produisant des vides, et par suite des ballottements de liquide qu'on avait précisément en vue d'éviter.

Paris, le 15 octobre, 1897.

P. P. on de la C^ie^ F.^se^ de l'acétylène dissous.

(Signé) JOSSE.

Trois rôles collationnés.

PARIS, le 26 Nov., 1907.

Pour expédition certifiée conforme Le Secrétaire général de l'Office National de la Propriété Industrielle. Robbe Conservatoire National des Arts et Métiers. Office National de la Propriété Industrielle.

Translation.

République Française.

Office National De La Propriété Industrielle.

Certified Copy of a Certificate of Addition to Patent No. 257,679.

Descriptive Memorandum annexed to the Certificate of Addition taken out on the 15th day of October, 1897, by the Compagnie Française de l'Acétylène dissous, represented by Mr. Josse, Paris, rue de Chaussée d'Antin, No. 58bis, and referring to the fifteen-year patent taken out on the 30th of June, 1906, by Messrs. Claude and Hess, for a System of Storing Acetylene.

Said Certificate of Addition was delivered by order of the Minister of Commerce, Industry, Posts and Telegraphs on the 1st of February, 1898.

The object of the improvements which we have made in the mode of carrying out our process is to facilitate and improve, for certain purposes, the absorption of the acetylene in liquids in which it is intended to be stored, whether such absorption be produced by simple solution or a kind of combination, which is difficult to determine and which, moreover, we need not explain here.

464 We have found that such absorption may be stimulated in certain cases by adding to the dissolving liquid bodies capable of mixing or combining with it or of dissolving in it. Such additional bodies may, of course, be solid, liquid or gaseous.

We claim therefore as our property this method, which is but a development of the original invention.

We will mention, though merely as an illustration, the following combination:

(F. P. 257679, 2d Cert. of Add'n.)

In 100 cm.^{3} of ethylic alcohol are dissolved 10 grams of oxide of methyl. This mixture possesses the property of dissolving twice as much acetylene as ethylic alcohol alone is capable of dissolving.

A very simple process for producing the compressed or liquefied acetylene consists in placing calcium carbide and water in a hermetically closed recipient. We claim, as a development of our original invention, the combination of this system with the use of dissolving liquids, which combination consists, e. g., in placing simultaneously in the hermetically closed recipient calcium carbide, water and acetone in proper proportions, namely:

40 grams of calcium carbide,
40 cm.^{3} of water,
60 cm.^{3} of acetone.

The acetylene evolved by the reaction of the water on the carbide dissolves in the acetone as fast as it is evolved, and thus it becomes possible to accumulate relatively large amounts of this gas at much

lower pressure than would have been attained without the addition of acetone.

This is one application of our general principle.

In a former addition we have already spoken of the use of solid porous or pulverized matter designed to fill completely the inner space of the recipients and to absorb the dissolving liquid, which latter is thereby prevented from shaking during transportation and from spilling in case of breakage. We set forth below an expedient and practical form of accomplishing this.

The porous matter is in the shape of a series of very light keramic bricks, which are accurately adjusted and piled up in the recipient so as to entirely fill the latter without

(F. P. 257679, 2d Cert. of Add'n.)

465 leaving any vacant spaces. These bricks have previously been perforated from end to end with a large number of very small holes (e. g., 1mm. in diameter). Acetone, or any other dissolving liquid, is then poured over these bricks in sufficient quantity to impregnate them, without however leaving any excess in the perforations.

When into a recipient thus prepared acetylene is then compressed this gas spreads through the whole mass thanks to the perforations left empty, and dissolves rapidly in the acetone with which the keramic matter is impregnated. On the other hand, when it is desired to use the gas accumulated it is evolved with the greatest regularity.

The solidity of the brick prevents any piling up, which would cause empty spaces, and consequently shaking of the liquid, which is the very thing sought to be obviated.

PARIS, October 15, 1897.

By power of attorney from the C.^{te} F.^{se} de l'Acétylène dissous.
(Signed) JOSSE.

(The correctness of the copy from which this translation is made is attested by the "Secrétaire generale de l'Office National de la Propriété Industrielle"—the head of the French Patent Office—by his signature and the seal of said Office.)

N. E. K.
2-11-11.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 26-A.)

(*Official Copy of Certificate of Addition Concerning French Letters Patent to Claude and Hess, No.* 257,679.) *Filed in the Circuit Court on Oct.* 27, 1911.

Republique Francaise,

Ministere Du Commerce, De L'Industrie, Des Postes Et Des Telegraphes.

Conservatoire National Des Arts et Metiers.

Office National De La Propriété Industrielle.

Copie Officielle D'un Certificat d'Addition du Brevet No. 257,679.

466 Mémoire Descriptif Annexé Au Certificat d'Addition pris le 11 Juin, 1897, par Messieurs Claude (Georges) et Hess (Albert) representés par Monsieur Chassevent, 11 boulevard Magenta, a Paris, et se rattachant au brevent d'invention de quinze ans pris le 30 Juin, 1896, pour un systeme d'emmagasinement de l'acétylène. Ledit certificat d'addition délivré par arrêté du Ministre du Commerce, de l'Industrie des Postes et des Télégraphes, en date du 19 Octobre, 1897.

Dans notre brevet principal, nous avons decrit et representé un systeme d'emmagasinement de l'acétylène permittant de renfermer sous un volume restreint et de transporter aisement d'acétylène applicable â un usage quelconque et en particulier a l'éclairage.

Par la présente demande de Certificat d'addition, nous venons rattacher à notre brevet un dispositif de sûréte s'appliquant particuliérement aux récipients d'acétylène dissous dans un liquide approprié, l'acétone, par exemple, suivant le procédé decrit dans notre brevet.

On sait, d'après les recherches de M. M. Berthelat et Vielle, que la dissolution d'acétylène dans l'acétone sous une pression ne depassant pas notablement 10 atmosphères est inexplosible, que seul est explosible l'espace situé au dessus du liquide et rempli d'acétylène gazeux.

Or, il est impossible d'éviter cet espace vide dans les récipients destinés à renfermer l'acétylène dissous, tant part suite des dilatations à prévoir que par suite de la diminution progressive du volume liquide lors de l'utilisation, de l'acétylène.

M. M. Berthelet et Vielle ont montré que cette explosion, bien qu'elle ne se transmette pas à la masse liquide, est susceptible néanmoins de soumettre le récipient a des pressions décuples de celle, sous laquelle est faite la dissolution.

Or, on peut admettre, à la rigueur que dans certains cas cette explosion de la masse gazeuse peut être provoqué, soit par une rentrée

de flamme due à la presence d'une certaine quantité d'air â l'intérieur du récipient, soit par l'inflammation d'une parcelle d'acétylures métalliques résultant du jeu d'un robinet. Du moment qu'on admet cette possibilité, pour se mettre à L'abri des effets de ces explosions on est conduit à adopter pour l'emmagasinement de l'acétylène dissous des récipients capables de leur résister et par suite assez lourds.

L'objet de la présente invention a pour but de dispenser de l'emploi de ces récipients spéciaux en limitant l'explosion en ad-
467 metant qu'elle vienne à se produire a une trés faible fraction de la masse gazeuse. On conçoit que si cette masse totale est capable, par sa décomposition, de faire monter la pression à 100 atmosphères, par exemple, l'explosion de la vingtième partie de cette masse ne fera monter la pression que de 5 atmosphères, surpression négligeable que les récipients, faits pour résister normalement à 10 atmosphères, supporteront aisément.

Le procédé en question consiste à utiliser les propriétés bien connues des toiles métalliques, en ce que concerne la propagation de l'inflammation des gaz.

La fig. 1 c-jointe représente l'application de notre invention à un récipient d'acétylène dissous, choisi à titre d'exemple étant bien entendu que cette invention à applique a toutes formes et dispositions des récipients.

A, est le récipient contenant la dissolution.

B, répresente l'espace rempli de gaz.

C, est la fermenture du récipient.

F. F^1 Sont les canaux nécessaires and opérations de remplissage et d'utilisation.

C'est uniquement par les conduits F F^1, comme on peut s'en rendre compte, qu'une inflammation accidentelle arriverait dans la masse gazeuse, car la fermeture Cest soudée sur le récipient et l'intérieur de celuici est constitué par un métal non attaquable par l'acétylène (ou étame').

Il suffit donc pour appliquer utilement notre invention dans ce cas, d'englober les orifices des canaux F F^1 dans une petite poche ou gaine en toile métallique G. Il va sans dire que suivant les besoins cette poche ou gaine, pourra, ou non, plonger partiellement dans le liquide étant donné l'inexploisiblité de celui-ci et être formée par une ou plusieurs épaisseurs de toile.

Nous nous réservons encore la possibilité dans certains cas de subdiviser la capacité entiere ou une partie seulement de la capacité du récipient par un empilage de toiles métalliques formant antour de diaphragmes perméables aux gaz et aux liquides, mais non à une flamme.

On remarquera que cet emploi des toiles métalliques quoique mettant en jeu une propriété bien conne constitue néanmoins une application nouvelle permettant de réaliser un résultat industriel nouveau et important. Ainsi, dans les lampes de mines, il s'agit de se protéger contre la transmission de la flamme de la lampe à
468 un mélange explosif accidentel et extérieur, tandis que dans notre cas on se protège contre les propriétés explosibles du

combustible lui-même, renfermé à l'intérieur d'un réservoir sous pression, cet emploi étant d'ailleurs justifié par les propriétés toutes spéciales que l'acétylène doit à sa nature endothermique.

Enfin observons que le mécanisme même de la protection due aux toiles métalliques est différent dans notre cas autre que le gaz est dix fois plus condensé, il faut remarquer que lorsqu'une explosion se produit à l'intérieur du manchon protecteur, les gaz inflammés, par suite de la haute pression développée, se précipitent à travers les mailles de la toile avec une vitesse bien plus grande que dans le cas de la lampe de mine ou la vitesse de propagation de la flamme intervient seule: il est donc de toute nécessité que dans notre cas, l'influence refroidissante de la toile soit beaucoup plus marquée; d'ou l'utilité dans certains cas de remplacer la toile métallique par des feuilles métalliques plus ou moins épaisses et perforées de petits trous, ou encore par un système de deux gaines concentriques en toile dout l'intérieur est rempli par exemple, de tournure de cuivre.

En Resumé:

Je revendique comme ma propriété entière et exclusive et se rattachant à notre brevet principal, l'application aux récipients destinés à contenir de l'acétylène en dissolution, de poches ou diaphragmes en toile métallique ou feuilles métalliques perforées, disposés de façon à limiter une explosion accidentelle à une faible fraction du volume gazeux conformément aux indications de la présente description, et en référer ence au dessin spécimen annexé.

Par procuration de Mrs. Claude et Hess, Paris, le 11 Juin, 1897.

(Signé) CHASSEVENT.

Collationné:

Cinq roles unrenvoi en marge comprenant quinze mats et une lettre.

PARIS, le 12 Mai, 1911.

Pour expédition certifiée conforme Le Secrétaire général de l'Office National de la Propriété Industrielle.

[SEAL.] M. NOBLESSE.

Vu pour la légalisation de la signature de M. Noblesse, Secrétaire Général de l'Office National de la Propriété industrielle.

469 PARIS, le 29 Mai, 1911.

Le Ministre du Commerce et de l'Industrie per autorisation le Chef du bureau du Personnel.

[SEAL.] LUCIEN MARCADET.

Le Ministre des Affaires Etrangères Certifié véritable la signature de M. L. Marcadet.

Paris, le 29 Mai 1911.

Pour Le Ministre Pour le Chef de Bureau Délégué.

[SEAL.] SCHNEIDER.

Agent Comptable des affaires étrangères le 29 Mai 1911.

Recy. 2 Franc 1.

Quittance N. 145. 2.

On the margin of the first page of this exhibit appears the following: United States Consulate General, Paris, France, 29th May, 1911. The seal of the Ministry of Foreign Affairs and the Signature of Mr. Schneider, are certified to be genuine.

[SEAL.] DEAN M. MASON.

($2 Fee stamp.)

26-a.

République Francaise.

Ministère Du Commerce Et De L'Industrie.

Conservatoire National des Arts et Métiers.

Office National De La Propriété Industrielle.

Official Copy of a Certificate of Addition Concerning the Patent No. 257,679.

Detailed Specification Joined to the certificate of addition taken on the 11th June, 1897, by Mr. Claude (George) and Mr. Hess (Albert), represented by Monsieur Chassevent 11 Boulevard Magenta in Paris, and concerning the patent of invention for fifteen years taken the 30th June, 1896, for an "Acetylene Stŏring System"; the said certificate of addition being delivered by an act from the French Minister of Commerce, Industry, Post and Telegraph, on the 19th October, 1897.

470 In our principal patent, we have represented and described a system for storing acetylene, by which it is possible to hold in a small volume and to transport easily, the acetylene applicable to any use whatsoever and particularly for lighting purposes.

By the present demand for a certificate of addition, we are connecting our patent with a safety appliance to be adapted especially on recipients where the acetylene is dissolved in an appropriated liquid, such as acetone, according to the process described in our patent.

It is known, from researches made by Messrs. Berthelot and Vielle, that the dissolution of acetylene in acetone under a pressure which is not very much over 10 atmospheres cannot explode, that only is explosive the space above the liquid which is filed with acetylene gas.

Of course it is impossible to avoid this empty space in recipients made to hold dissolved acetylene as much on account of the expansions to be foreseen as for the progressive diminution of liquid volume when using the acetylene.

Messrs. Berthelot and Vielle have shown the explosion although not transmitted to the whole of the liquid, is susceptible however of submitting the recipient to ten times the pressure of that under which is made the dissolution.

Now it can be admitted, that in certain cases this explosion of the mass of gas may be provoked either by an inlet of flame owing to the presence of a certain quantity of air inside the recipient, or by the inflammation of a particle of metallic acetylene resulting from the play in a tap. Since we admit this possibility, to be protected from the effects of these explosions, one is led to adopt for the storing of dissolved acetylene, some recipients which are capable to resist them, and therefore which would be rather heavy.

The object of the present invention is to the effect that special recipients may be dispensed with by limiting the explosion—supposing that it should happen—to a very small fraction of the whole mass of gas. It will be understood that if this total mass is capable, by its decomposition, to get the pressure up to 100 atmospheres for instance, the explosion of the twentieth part of this mass would only raise the pressure to 5 atmospheres, an excess of pressure which can be neglected and which the recipient, made to resist normally at 10 atmospheres will stand quite easily.

471 The process in contemplation is to utilize the well known properties of metallic gauze, as regards the propagation of the gases igniting.

Fig. 1 on the accompanying drawing, represents the application of our invention to a recipient of dissolved acetylene chosen as an example, it being well understood that this invention applies to all shapes and dispositions of the recipients.

A is the recipient containing the dissolution; B represents the space filled up with gas; C is the cap to close up the recipient; F and F^1 are passages which are necessary for the operations of filling and utilization.

It is only through the passages F and F^1, as may be expected, that an accidental inflammation would get to the gaseous mass, for the cap C is soldered to the recipient and the inside of the latter is tinned or made of some metal which cannot be attacked by acetylene.

It is sufficient therefore, in order to usefully apply our invention in this case, to cage up the appertures of the passages F and F^1 in a small pocket or sheath G made of metallic gauze. It goes without saying that according to need, this pocket or sheath may, or may not, partially plunge into the liquid as this is unexplosive, and be formed by one or several thicknesses of gauze.

We also reserve for ourselves the possibility, in certain cases, of subdividing the entire capacity or part only of the recipient, by piling up layers of metallic gauze forming all round so many diaphragms, which would be permeable to the gases and liquids, but not to a flame.

It will be noticed that the use of metallic gauze, although adopting a well known property, constitutes nevertheless a new application which makes it possible to realise a new and important industrial result. For instance, with mining lamps the question is to be protected from the transmission of the lamp's flame to an accidental and outside explosive mixture; whereas in our case, the question is to protect one's self against the explosive properties of the combusti-

ble itself, held inside a reservoir under pressure, this use moreover being justified by the entirely special properties which acetylene owes to its self heating nature.

Finally, we must observe that the mechanism itself of the protection with the metallic gauze is different in our case; besides the gas being 10 times more condensed, it must be remarked that
472 when an explosion takes place inside the protecting mantle, the ignited gases, on account of the high pressure developed, are precipitated through the meshes of the gauze with a much greater speed than in the case of a miner's lamp, where the speed of the flame propagating interferes alone; it is therefore necessary that in our case, the cooling influence of the gauze be much more marked; whence the usefulness in certain cases to replace the metallic gauze by sheet metal more or less thick and perforated with little holes, or even by an arrangement of two concentric sheaths of gauze filled in between with for instance, some brass turnings.

In short, I claim as my entire and exclusive property, and in connection with our principal patent, the application on recipients having to contain acetylene in dissolution, of pockets or diaphragms in metallic gauze or perforated sheet metal, disposed in such a way as to limit an accidental explosion to a small fraction of the gas volume in accordance with the particulars of the present description, and with reference to the accompanying specimen drawing.

Pp. from Mr. Claude and Mr. Hess, Paris, 11th June 1897.

(Signed) CHASSEVANT.

Checked: Five pages, a note in the margin comprising fifteen words & a letter (initials).

PARIS, 12th May, 1911.

Examined & Passed by the General Secretary National Patent Office.

——— ———.

(Signature.)

The drawing attached to Defendant's Exhibit No. 26*a* is not inserted here, for the reason that it is reproduced at page 279 of this transcript.

(DEFENDANTS' EXHIBIT No. 26-B.)

(Official Copy of Certificate of Addition Concerning French Letters Patent to Claude and Hess No. 257,679.)

Filed in the Circuit Court on Oct. 27, 1911.

Republique Francaise.

Ministère Du Commerce Et De L'Industrie.

Conservatoire National Des Arts Et Métiers.

Office National De La Propriété Industrielle.

Copie Officielle D'un Certificat d'Addition se Rattachant au Brevet No. 257,679.

Mémoire Descriptif Annexé Au certificat d'addition pris le
473 26 Avril 1898 par Messieurs Claude (Georges) et Hess (Albert), représentés par Mr. Chassevent, 11, boulevard Magenta, à Paris, et se rattachant au brevet d'invention de quinze années pris le 30 juin 1896 pour un Système d'emmagasinement de l'acétylène.—Ledit certificat d'addition delivré par arrêté du Ministre du Commerce, de l'Industrie, des Postes et des Télégraphes en date du 17 acût 1898.

Au cours de l'étude expérimentale des dispositifs de sûreté indiqués dans le certificat d'addition en date du 11 juin 1897, à notre brevet No. 257,679, nous avons reconnu que la disposition des plaques métalliques perforées de petits trous no'offrait une sécurité absolue qu'à la condition que ces trous présentent une longueur assez grande. D'où l'emploi, comme nous l'avons dit, soit d'un empilage de plaques, soit d'une seule plaque suffisament épaisse dans laquelle des canaux longitudinaux seront perforés.

Dans ce dernier cas, comme nous avons trouvé qu'en outre les canaux devaient être très fins et comme leur percement sur une assez grande longueur serait délicat nous avons été amenés, pour rendre plus pratique leur réalisation, à constituer le dispositif de sûreté par un faisceau de fils métalliques très fins et parallèles entre eux. Ces fils peuvent être énergiquement serrés les uns contre les autres, par exemple en les introduisant dans un tube métallique et tréfilant celui-ci jusqu'au degré voulu.

De cette manière, les intervalles entre les fils constituent des canaux très fins, très nombreux, que le gaz est obligé de traverser; nos

De cette manière, les intervalles entre les fils constituent des canaux très fins, très nombreux, que gaz est obligé de traverser; nos expériences nous ont montré qu'un semblable faisceau, de longuer non exagérée (de 1 à 5 centimètres), interposé sur le trajet du gaz,

s'opposait absolument à la propagation des ondes explosives, jusqu'aux pressions expérimentées de douze atmospheres.

Si donc deux espaces remplis d'acétylène ne communiquent entre eux que par l'intermédiare des canaux fins d'un semblable faisceau, une explosion se produisant pour une cause accidentelle quelconque dans un de ces espaces ne pourra se propager dans l'autre.

A titre d'exemple d'application pratique de ce système, la figure 1 répresente l'addition d'un faisceau de ce genre F à un récipient A d'acétylène dissous dans le but d'empêcher une onde explosive venant de l'extérieur de se propager à l'intérieur du récipient.

474 La figure 2 représente une application du même genre. Mais le récipient est supposé alimenter, par l'intermédiare d'une canalisation, plusieurs becs, distincts et le faisceau est placé sur le trajet même de la conduite, de manière à empêcher une onde explosive, non seulement d'atteindre le récipient, mais encore de parcourir la partie B de la canalisation située en arrière du faisceau F.

En Résumé, nous revendiquons comme notre propriété, un dispositif de sûreté consistant à forcer le gaz acétylène, à sa sortie de l'espace où l'on veut éviter qu'une explosion se propage, à travers les canaux d'un faisceau constitué par des fils métalliques fins et parallèles entre eux.

Par procuration de MM. Claude et Hess.

Paris, le 25 avril 1898.

(Signé) CHASSEVENT.

Collationné: un rôle et demi un mot rayé nul (initials).

PARIS, le 12 Mai, 1911.

Pour expedition certifiée conforme Le Secrétaire général de l'Office, National de la Propriété Industrielle.

[SEAL.] M. NOBLESSE.

Vu pour la légalisation de la signature de M. Noblesse, Secrétaire Général de l'Office National de la Propriété Industrielle.

PARIS, le 29 Mai, 1911.

Le Ministre du Commerce et de l'Industrie per autorisation, le Chef du bureau du Personnel.

[SEAL.] L. MARCADET.

Le Ministre des Affaires Etrangères, Certifié veritable la signature de M. L. Marcadet, Paris le 29 Mai 1911, Pour le Ministre Pour Le Chef de Bureau Délégué.

[SEAL.] SCHNEIDER.

Agent Comptable des Affaires Etrangères le 29 Mai 1911 Reçu. 2 Francs 5 Quittance 25/1.

United States Consulate General, Paris, France, 29th May, 1911.

475 The Seal of the Ministry of Foreign Affairs and the signature of Mr. Schneider, are certified to be genuine.

[SEAL.] DEAN M. MASON,
Vice-Consul-General of the United States of America at Paris (France).

($2 fee stamp.)

26-*b*.

République Francaise.

Ministère Du Commerce Et De L'Industrie.

Conservatoire National des Arts et Métiers.

Office National De La Propriété Industrielle.

Official Copy of a Certificate of Addition Concerning the Patent No. 257,679.

Detailed Specification Joined to the Certificate of Addition Taken the 26th April, 1898, by Messrs. Claude (George) and Hess (Albert), represented by Monsieur Chassevent, 11 Boulevard Magenta in Paris, and concerning the patent of invention for fifteen years taken on the 30th June, 1896, for an Acetylene Storing System. The said certificate of addition being delivered by an act from the French Minister of Commerce, Industry, Post and Telegraph, dated the 17th August, 1898.

In the course of our experiments with the safety appliances mentioned in the certificate of addition to our patent No. 257,679, dated 11th June, 1897, we have found that the arrangement of metallic plates perforated with small holes, only offered an absolute security when these holes were made sufficiently long. Where the use, as we have said, either of a quantity of plates, either of a single plate sufficiently thick in which longitudinal channels would be drilled.

In this last case, as we have found besides that the channels must be very fine, and as the drilling on a good length would be a delicate matter, we have been [lead], in order to realise the idea more practically, to make the safety appliance with a bunch of wires, very fine and parallel with each other. These wires may be strongly bound together by introducing them, for instance, in a metal tube which would then be drawn to the required degree.

476 In this way, the spaces between the wires constitute very fine and numerous channels, through which the gas is obliged to pass; our experiments have proved that such a bunch, of no exaggerated length (from ½ in. to 2 in.) interposed on the passage of the gas, absolutely prevents the propagation of the explosive waves, up to the tested pressures of twelve atmospheres.

If therefore, two spaces filled with acetylene only communicate with each other by the intermediary of fine channels formed with

a bunch of wires as described, and an explosion is produced by an accidental cause whatsoever in one of those spaces, it could not reach into the other.

As an instance of a practical application of this system, fig. 1 represents the fixing of such a bunch F to a recipient A of dissolved acetylene, for the purpose of preventing an explosive wave coming from the exterior and reaching the interior of the recipient.

Fig. 2 represents an application of the same kind, but the recipient is supposed to feed several distinct burners by means of tubing, and the bunch is placed on the path itself of the main tube, so as to prevent an explosive wave not only reaching the recipient, but also finding its way into the part B of the tubing which is placed after the bunch F.

In short, we claim as our property, a safety appliance compelling the acetylene, as it comes out of the space where it is required that an explosion should be avoided, to go through the passages formed by a bunch of very fine wires placed parallel with each other.

Checked: One sheet and half and one word crossed out (initials).
By procuration from Messrs. Claude and Hess.
Paris, 25th April, 1898.
(Signed) CHASSEVENT.

PARIS, 12th May, 1911.

Examined and passed by The General Secretary of the National Patent Office.

____ ____.
(Signature.)

The Drawing attached to Defendants' Exhibit No. 26*b* is not inserted here, for the reason that it is reproduced at page 280 of this transcript.

(DEFENDANTS' EXHIBIT No. 27.)

(*Certificate of Expiration of English Patent to Claude and Hess No.* 29750.)

Form P. Cert. 1a.

477 Patents and Designs Act, 1907.

It is Hereby Certified by Henry Hatfield, acting for the Comptroller-General of Patents, Designs, and Trade Marks, that in pursuance of the application of Georges Claude and Albert Hess No. 29750 of 1896, a Patent was granted on the 15th March, 1898, and sealed as of the 30th June, 1896, under the provisions of Section 103 of the Patents, Designs and Trade Marks Act, 1883; that the said Patent was granted for the term of fourteen years from the 30th June, 1896, provided the payments prescribed by Section 17,

subsection 2 of the said Act were duly made; and that the Patent in question expired on the 30th June, 1900, through failure to pay the prescribed renewal fee which became due on that date.

Witness my hand this 7th day of March, 1911.

[SEAL.] H. HATFIELD,
Acting for the Comptroller-General of Patents, Designs, and Trade Marks.

Consulate-General of the United States of America for Great Britain and Ireland at London.

I, Richard Westacott, Vice and Deputy Consul-General of the United States of America for Great Britain and Ireland at London, do hereby make known and certify to all whom it may concern, that the signature "H. Hatfield" subscribed to the annexed certificate is of the true and proper handwriting of H. Hatfield, acting for the Comptroller General of Patents, Designs and Trade Marks, London, England, that the seal affixed to the said Certificate is the seal of the Patent Office, London England and that to all acts signed as the annexed full faith and credit are and ought to be given in Judicature and thereout.

In Testimony Whereof I have hereunto set my hand and affixed the Seal of the Consulate-General of the United States at London, aforesaid, this 10th day of March, 1911.

[SEAL.] RICHARD WESTCOTT,
Vice and Deputy Consul-General.

Consulate General, American Consular Service. 10 Mar., 1911. $2 Fee Stamp. U. S. A. London. 1369.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911. Wm. P. Thompson & Co., Patent Agents, 6 Lord St. Liverpool.

478 CLERK'S NOTE.—Defendants' Exhibit No. 28, (Claude & Hess German patent) is not inserted here, for the reason that same appears on pages 267 to 272 of this transcript.

(DEFENDANTS' EXHIBIT No. 29.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of the Title Page and an Extract from Page 62 of a Bound Volume in the Library of this Office entitled: Report of the Sixth Meeting of the British Association for the Advancement of Science; said Volume received in the Library prior to February 13, 1862.

In Testimony Whereof I have hereunto set my hand and caused

the seal of the Patent Office to be affixed at the City of Washington, this 28th day of April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Report of the Sixth Meeting of the British Association for the Advancement of Science.

Held at Briston, in August, 1836.

Vol. V.

London.
John Murray, Albermarle Street.
1837.

Extract from Page 62.

479 The new gas may be kept over mercury for an indefinite time without undergoing any apparent change, but it is slowly absorbed by water. Distilled water recently boiled, when agitated in contact with the new gas, absorbs about its own volume of it; but on heating the aqueous solution the gas is evolved apparently unaltered. The new gas is absorbed to a certain extent by, and blackens, sulphuric acid. It detonates powerfully when mixed with oxygen gas, especially if the latter forms three fourths or more of the mixture; and the only products of its combustion with oxygen are carbonic acid gas and water.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 30.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of the Title Page and an Extract from Page 16 of a Bound Volume in the Library of this Office entitled: First Outlines of a Dictionary of Solubilities of Chemical Substances by Storer; Volume received in the Library March 7, 1867.

In Witness Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 28th day of April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

First Outlines of a Dictionary of Solubilities of Chemical Substances.

By Frank H. Storer.
Cambridge.

480 Sever and Francis.
1864.

Extract from Page 16.

It can be said, in general terms, that alcohol is a good solvent for substances which contain much hydrogen, as resins, ethers, essential oils, including those which are oxygenated, fats, the alkaloids, coloring matters, and many organic acids. It does not dissolve the sulphates or carbonates of the metallic oxides. It also dissolves sugars and soaps.

"Those gases which are abundantly absorbed by water likewise dissolve in considerable quantity in alcohol; and those which are sparingly absorbed by water are also taken up in small quantity only by alcohol; but alcohol generally takes up a greater quantity of a gas bulk for bulk, than water.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 31.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of the Title Page and an Extract from Page 257 of a Bound Volume in the Library of this Office entitled: Hand-Book of Chemistry, by Gmelin; said Volumes received in the Library May 8, 1882.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 28th day of April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

481 Hand-Book of Chemistry, by Leopold Gmelin.

Vol. VIII.

Organic Chemistry.

Vol. II.

Organic Compounds Containing Two and Four Atoms of Carbon.

Translated by Henry Watts, B. A., F. C. S.

London.
Printed for the Cavendish Society.
MDCCCLIII.

(*Extract from Page* 257.)

B. Alcoholic Solutions.

These gases, which are abundantly absorbed, by water, likewise dissolve in considerable quantity in alcohol; and those which are sparingly absorbed by water, are also taken up in small quantity only by alcohol; but alcohol generally takes up a greater quantity of a gas, bulk for bulk, than water.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 32.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This Is to Certify that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents, in the matter of the Letters Patent of Edward N. Dickerson and Julius J. Suckert, Assignors to United States Acetylene Liquefaction Company. Number 582,274, Granted May 11, 1897, for Improvement in Apparatus for Gasifying and Controlling Liquefied or Compressed Gas.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Wash-
482 ington, this 18th day f April, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

(Serial Number) 581,842. Div. 31. (Ex'r's Book) 44. 1896. Div. 31.

Patent No. 582,274.

Edward N. Dickerson & Julius J. Suckert, Ass'ors to the United States Acetylene Liquefication Company, ([Corp.]* of N. Y.)
Of New York,
County of ——,
State of New York.
Invention: Apparatus for Gasifying & Controlling Liquefied Acetylene Gas.

Parts of application filed.
3
Petition, Mch. 4, 1896.
Affidavit, Mch. 4, 1896.
Specification, Mch. 4, 1896.
Drawing F, Mch. 4, 1896.
Print, Sept. 17, 1896.
Model No. —.
Specimen No. —.
First fee, cash, $15, Mch. 4, 1896.
First fee cert., ——, —.
App. filed complete Mch. 4, '96.
2. —.
Examined Mch. 31, 1897—G. S. Ely, Ex'r.
Countersigned: J. W. Babson, For Commissioner.
4, 2, '97.
Notice of allowance, April 2, 1897.
3. —.
Final fee, cash, $20, April 17, 1897.
483 Final fee cert., ——, 189–.
Patented May 11, 1897.

Asso., Foster & Freeman, City.

E. N. Dickerson, 253 B'dw'y, New York, N. Y.

United States Patent Office.

To the Commissioner of Patents:

Your Petitioners Edward N. Dickerson and Julius J. Suckert both of the City, County and State of New York, pray that Letters Patent may be granted to themselves for the improvement in Apparatus for Gasifying and Controlling Liquefied Acetylene Gas, set forth in the annexed Specification, and they hereby appoint Edward N. Dickerson, of 253 Broadway, in the City of New York, their attorney with full power of substitution and revocation, to prosecute this application, to make amendments and alterations therein, to sign the drawings, to receive the patent, and to transact all business in the Patent Office connected therewith.

E. N. DICKERSON.
JULIUS J. SUCKERT.

[* Words and figures enclosed in brackets erased in copy.]

Specification.

To all whom it may concern:

Be it known, that we, Edward N. Dickerson and Julius J. Suckert, both of the City, County and State of New York, have invented a new and useful Improvement in Apparatus for Gasifying and Controlling Compressed or Liquefied Gas, of which the following is a full, true and exact description, reference being had to the accompanying drawings:

This invention relates to an improved mechanism for allowing the escape of liquefied gas, especially acetylene gas, into a gaseous condition or of compressed gas to a lower pressure and controlling this operation so as to render the same safe.

In applying liquefied or compressed acetylene gas to the illumination of houses, or for other purposes where the gas must be reduced in pressure to enable its practical application, it is necessary to effect the reduction in pressure by mechanical appliances, technically known as reducing valves, and ordinarily operating by means of a diaphragm or piston or float, which when the reduced pressure exceeds the prescribed limit, closes off by means of suitable levers the valve feeding the compressed gas to be reduced in pressure.

Again the tanks containing the compressed or liquefied gas may at times be subjected to intense heat, whereby the pressure generated in the tanks by the expansion of the gas will exceed the
484 bursting pressure of the tanks, thereby causing their rupture.

To prevent an excess of pressure in the valve in the pipes or other apparatus connected with the reducing valve by reason of the failure of this valve to operate, or by reason of the rupture of the diaphragm (in case a diaphragm valve is used), and also to prevent an excess of pressure developing in the tank through excessive heating of the same, are objects of our invention. Our apparatus may be arranged in various forms, but we have shown one embodying our invention.

In the drawings, Figure 1, represents an elevation, partly in section of our apparatus; and

Figure 2, a sectional view of the valve C, Figure 1.

A, represents a tank containing liquefied or compressed acetylene gas, which is preferably surrounded by water or other suitable liquid contained in the tank B. The tank B may be provided with suitable mechanism, as, for instance, a float valve, for maintaining the supply of water therein. Attached to the top of the tank A is the valve C, provided with a valve stem *g* which on unscrewing permits the gas to escape from the tank A to the outlet nozzle *h*, and through pipe *i* to the diaphragm reducing valve E. The pipe *i* may be provided with valve stop cock *b* and pressure guage D. The gas escaping from the reducing valve E passes through pipe *j* and can then be utilized for any purpose desired. As shown in Figure 1, the gas is conducted through pipes *k l* to the burners *e e* where it is ignited and used for illuminating purposes. The pipe *j* is continued by pipes *m* and *o* provided with stop cock *d* to the liquid seal trap F, in

which the pipe *o* is bent downward forming a seal, as shown at *p*. The outlet leading from the trap F connects to the pipe *r* which leads any gas escaping through the seal of the trap through the external wall H of the building and to the outer atmosphere. The outlet *a* on valve C connects directly with the interior of the tank A, and therefore enters the valve below the valve seat upon which the valve stem *g* rests. This outlet *a* is provided with diaphragm *f*, shown in Figure 2, and is connected by means of the pipes *s s* to the pipe *r*. The diaphragm *f* is preferably made of a fusible alloy, for instance, of an alloy formed of tin 12 parts, lead 25 parts, bismuth 50 parts and cadmium 13 parts. It is made of such a thickness that it will burst when the pressure in the tank approximates the fusing point of the alloy by reason of heat applied to that tank. For instance, if the alloy be fusible at about 150 to 160° F., a diaphragm having an opening [*lf*] ¼ of an inch should have a thickness of about 1/16 of an inch. Under these circumstances, in case of heating of the tank before any excessive pressure could be generated a double safety is provided by such diaphragm in the fact that it will both fuse and yield at about the same pressure due to the temperature of the tank.

485

Insert D, March 1, '97.

The pipe *u* forms a connection between the pipe *s* and the flanged head *v* forming a tight cover above the operating diaphragm of the valve E.

The operation of our device is as follows: In case the diaphragm of the valve E fails to close the valve properly and an excess of pressure passes into the reduced pressure side of the valve, the gas will pass through the liquid seal contained in F and escape through the pipe *r* to the atmosphere. Should the diaphragm of the valve [C]* E become ruptured, the gas escaping therefrom will pass through the pipe *s* and the pipe *r* to the atmosphere. The said diaphragm *f* may be ruptured by an excess of pressure or by heat, as previously described. In replacing a new cylinder A, the valve *b* is closed. The valves *d* and *c* also permit the closing off of portions of the apparatus when it is necessary to examine or repair them.

In transportation a cap is applied in place of the coupling *t* shown in Figure 2 and also if desired in place of the coupling *h*.

It is obvious that though we have shown a diaphragm reducing valve, we intend to include thereby any other suitable form of reducing valve such as a float valve having a cup moving in a seal.

What we claim as our invention, and desire to secure by letters patent, is—

[Words and figures enclosed in brackets erased in copy.]

[Substitute B, Nov. 24 '96.]* Substitute A, Oct. 2, '96.

1. The combination with a tank containing compressed or liquefied gas of a fusible diaphragm of said thickness as to allow the escape

[Oct. 2, '96.]* of the gas both by fusing and bursting before the existence of excessive pressure in the cylinder, substantially as described.

2. The combination in a gas pressure reducing apparatus of a cylinder A containing compressed or liquefied gas, a

Oct. 2, '96. reducing valve E, connected to the low pressure side of the reducing valve E and an escape valve F substantially as described.

3. The combination of a tank A containing compressed or liquefied gas, the reducing valve E, the connection *u* above the diaphragm or float, said reducing valve communicating with the atmosphere, substantially as described.

486 4. The combination of the cylinder A for containing compressed or liquefied gas, the connection *i* to reducing valve E, the escape seal F communicating with pipe *r*, and the connection *u* above the diaphragm or float of the reducing valve also connecting

Insert A', Oct. 2, '96. with the [diaphragm]* pipe r substantially as described.

[Matter enclosed between rules erased in copy.]

In Testimony Whereof, we have signed our names to this Specification in the presence of two subscribing witnesses.

E. N. DICKERSON.
JULIUS J. SUCKERT.

Witnesses:
H. COUTANT.
ANTHONY GREF.

Oath.

STATE OF NEW YORK,
City of New York,
County of New York, ss:

Edward N. Dickerson and Julius J. Suckert, the above named petitioners, citizens of the United States, and residents of New York City, County and State, being duly sworn, depose and say that they verily believe themselves to be the original, first and joint inventors of the improvement in Apparatus for Gasifying and Controlling Liquefied Acetylene Gas, described and claimed in the foregoing Specification; that the same has not been patented to them or to others with their knowledge or consent in any country; that the same has not to their knowledge been in public use or on sale in the United States for

[Words and figures enclosed in brackets erased in copy.]

more than two years prior to this application, and they do not know and do not believe that the same was ever known or used prior to their invention thereof.

E. N. DICKERSON.
JULIUS J. SUCKERT.

Sworn to and subscribed before me, this 3d day *day* of March, 1896.

[NOTARIAL SEAL.] ANTHONY GREF,
Notary Public, New York County.

Indorsed: U. S. Patent Office, Mar. 4, 1896. Chief Clerk. U. S. Patent Office, Mar. 7, 1896. Division 31. Serial No. 581,842, Paper No. ½. Appl'n. Filed March 4, 1896. Dickerson & Suckert.

487 Div. —.

Address only "The Commissioner of Patents, Washington, D. C."

No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., April 7, 1896.
Mailed " " "

Edward N. Dickerson and Julius J. Suckert, care of E. N. Dickerson, 253 Broadway, New York City:

Please find below a communication from the Examiner in charge of your application, No. 581,842, Apparatus for Gasifying and Controlling Liquefied Acetylene Gas. Filed March 4, 1896.

JOHN S. SEYMOUR,
[E. B. MOORE,]*
Commissioner of Patents.

This case has been examined. Page 4, line 15 substitute E for "C."

Claim 1 is rejected upon patent 347,216, Westcott, Aug. 10, 1886, (Fire Extinguishers, Chemical).

Claim 2 is rejected upon British Patent 11,848, Dickerson, June 18, 1895.

Claims 3 and 4 cover an ordinary reducing valve and are each rejected upon patents 339,757, Fulton, April 13, 1886; 385,619, Haldeman, July 3, 1888 and 444,263, Acton, Jan. 6, 1891, (Fluid Pressure Regulators Diaphragm).

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 581,842, Paper No. 1, Rejec. Dated April 7, 1896.

[* Words and figures enclosed in brackets erased in copy.]

Room 39.

Applicants, Dickerson & Suckert. Invention, App'r's for Gasifying & Controlling Liquefied Acetylene Gas. Filed March 4, 1896. Serial #581,842.

To the Hon. Commissioner of Patents.

SIR: Herewith we file an associate power-of-attorney from
488 E. N. Dickerson, in the above entitled application.

Respectfully,

FOSTER & FREEMAN,
Attorneys for Applicants.

Washington, D. C., September 8, 1896.

NEW YORK, April 11th, 1896.

Room No. 39.

In the Matter of the Application of E. N. Dickerson and J. J. Suckert for an Improvement in Apparatus for -asifying and Controlling Liquefied Acetylene Gas. Filed March 4th, 1896. Serial No. 581,842.

Hon. Commissioner of Patents, Washington, D. C.

SIR: I hereby appoint Charles E. Foster and Frank L. Freeman, composing the firm of Foster & Freeman, of Washington, D. C., my associate attorneys in the above-entitled application.

Respectfully,

E. N. DICKERSON,
Att'y for Dickerson & Suckert.

Indorsed: U. S. Patent Office, Sept. 8, 1896. Division 31. 39 Serial No. 581,842, Paper No. 2. Asso. Power of Attorney. Dated Sept. 8, 1896.

* * * * * * *

(Here follows a copy of the drawings of Letters Patent No. 582,-274, to Dickerson and Suckert, which is omitted at this point for the reason that a copy of same appears at page 329 of this printed record.)

Indorsed: Serial No. 581,842, Paper No. —. Print. Filed Sept. 17, 1896.

489 Room 39.

Applicants, E. N. Dickerson & E. J. Suckert. Invention, "App. for Gasifying & Controlling Liquefied Acetylene Gas." Filed March 4, 1896. Serial No. 581,842.

To the Hon. Commissioner of Patents.

SIR: *We think the office is in error in requesting us to substitute "E" for "C" on page 4, line 15.*

Canceled Nov. 24, '96.

In regard to the claims, we amend them as follows: Claim 1, line 3, after the word "gas" insert: BOTH BY FUSING AND BURSTING.

Claim 2, line 3, after "valve F" insert: connected to the low pressure side of the reducing valve E.

Substitute for claim 3 the following:

A. 3. The combination with the tank A, having safety connection *s*, and reducing valve E, of the connection *u*, above the diaphragm or float of said reducing valve, communicating also with the pipe *s*, which pipe communicates with the atmosphere, substantially as described.

[*Claim 4, line 5, for the word*]* *"diaphragm" read: (pipe r)*

[Matter enclosed between rules erased in copy.]

This will make the claim more definite and clear, and we think it will be found that it is not anticipated in any of the references, which do not show the same construction or mode of operation or purpose.

Add the following as claim 5:

A¹. 5. The combination with a cylinder containing compressed or liquefied gas, of a reducing valve, a pipe connecting the cylinder and reducing valve, a valve in said pipe, an independent connection with the cylinder containing a rupturable diaphragm, and a connection between said independent connection and the reducing valve, substantially as described.

Respectfully,

FOSTER & FREEMAN,
Attorneys for Dickerson & Suckert.
(F.)

490 Washington, D. C., October 3, 1896.

Indorsed: U. S. Patent Office, Oct. 2, 1896, Division 31. Serial No. 581,842, Paper No. 3. Am'd't A. Filed Oct. 2, 1896. Dickerson & Suckert.

[* Words and figures enclosed in brackets erased in copy.]

Div. —, Room —.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communication- respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Nov. 3, 1896.
Mailed " " "

Edward N. Dickerson and Julius J. Suckert, care of Foster and Freeman, City:

Please find below a communication from the Examiner in charge of your application, No. 581,842, Apparatus for Gasifying and Controlling Liquefied Acetylene Gas. Filed March 4, 1896.

JOHN. S. SEYMOUR,
[E. B. MOORE,]*
Commissioner of Patents.

The amendment filed Oct. 2, 1896, has been entered and considered.

Claim 1 is again rejected upon the patent to Westcall, of record which *disclaims* a plug or plate of fusible material of such a thickness as not to be broken by pressure. In view of this it is held that there would be no patentable invention in constructing this plug or plate of such thickness as to be broken by pressure. This feature however, is old in this patent as will be seen on page 1, line 46; page 2, lines 61, 87.

Claim 2 the patent 385,619, Haldeman, which shows it old to provide an escape valve connected to the low pressure side of the reducing valve and there would be no invention in substituting the Halderman regulator for the regulator R shown in the British patent 11,848, 1895, cited.

Claims 3, 4 are each held met by patents to Haldeman, 385,619 and Acton, 444,363, of record and is rejected.

491 Claim 5 as at present advised may issue.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 581,842, Paper No. 4, Rejec. Dated Nov. 3, 1896.

[* Words and figures enclosed in brackets erased in copy.]

Room 39.

Applicants, Dickerson & Suckert. Invention, "App. for Gasifying & Controlling Liquefied Acetylene Gas." Filed March 4, 1896. Serial No. 581,842.

To the Hon. Commissioner of Patents.

SIR: We amend this case by erasing present claims 1 to 4 inclusive and substituting in lieu thereof the following:

Substitute C, Jan. 13, '97.

[B.]* 1. The combination with a tank containing compressed or liquefied gas, of a burstable and fusible diaphragm of such thickness and material as to allow the escape of the gas both by bursting and fusing before the existence of excessive pressure in the cylinder, whether caused by failure of operation of the connected parts or by excessive heating, substantially as described.

2. The combination in a gas reducing apparatus, of a cylinder A containing compressed or liquefied gas, a reducing valve E connected to the cylinder, and a burstable and fusible escape valve *f* substantially as described.

3. The combination with the tank A, of the reducing valve E, the safety connection *s*, and a connection *u* above the diaphragm or float of the reducing valve and communicating with the safety pipe *s* which pipe communicates with the atmosphere, substantially as described.

[Matter enclosed between rules erased in copy.]

B. 4. The combination with the cylinder

to contain

Jan. 13, '97. A [for containing]* compressed or liquefied gas, of the connection *i*, the reducing valve E, the escape seal F connected to the reduced pressure side of the reducing valve, a pipe *r*, connected to the escape seal and communicating to the atmosphere, and a connection *u* above the diaphragm or float of the reducing valve and communicating with pipe *r*, substantially as described.

492 We have redrawn these claims to more clearly express applicants' invention over what is shown in the references.

In regard to claim 1, applicants will admit that a diaphragm breakable by excess of pressure was old. They also admit that a diaphragm which was fusible under excessive heat was old, but so far as the references show and so far as applicants know a single

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[Words and figures enclosed in brackets erased in copy.]

diaphragm which combines these two functions is absolutely new, and we think undoubtedly patentable.

In the Wescott patent #347,216 they distinctly state "Our breakable diaphragm is not one to be broken by fusion, but by the pressure in the pipe."

Applicants have provided a diaphragm which is breakable or burstable under a certain pressure, such as may happen in the tank, if for instance, the reducing valve or other mechanical parts of the apparatus should fail to operate properly. They have also provided the same diaphragm of a composition which will fuse, if perchance the tank becomes exceedingly heated, causing a dangerous pressure. This is necessary in connection with a tank containing compressed or liquefied gas the excessive pressure in which is developed through heating. They have solved a problem which has not been set before anyone to solve so for as we know, and they have solved it in an absolutely new way, and produced an absolutely new structure, which certainly involves invention. To produce such a structure required a great deal of careful experimenting. It was not a mere matter of selection. No one of the breakable or fusible diaphragms heretofore known could be used by applicants and accomplish the results intended. They have given to the world something it did not have before, and we think the Examiner will fully appreciate the value of such a device in the new art of storing compressed or liquefied gases in tanks.

In regard to claim 2, which is said to be rejected on Haldeman #385,619, in view of British patent #11,848, as now stated it certainly shows what is not shown in either or both of these patents combined. It shows a useful and valuable combination, and we think should be patented.

In claim 3 we have also set forth a new combination, which is not found in either or both of the Haldeman and Acton patents. Applicants do not claim broadly an escape valve connected with the low pressure side of a reducing valve, but they do claim a combination and arrangement of the elements of the device, all of which co-operate in producing a new and valuable function, and we trust that the claims as thus specified will receive [favorable] action.

Respectfully,

FOSTER & FREEMAN,
Att'ys for Dickerson & Suckert.
(F.)

Washington, D. C., Nov. 23, 1896.

493 Indorsed: U. S. Patent Office, Nov. —, 1896. Division 31. Serial No. 581,482, Paper No. 5. Amendment B. Filed Nov. 24, 1896. Dickerson & Suckert.

Div. —, Room —.

Address only "The Commissioner of Patents, Washington, D. C.

Paper No. —.

All communications respecting this application should give th serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Dec 29, 1896.
Mailed Dec. 29, 1896.

Edward N. Dickerson and Julius J. Suckert, care of Foster and Free man, City:

Please find below a communication from the Examiner in charg of your application, No. 581,842, Apparatus for Gasifying and Con trolling Liquefied Acetylene Gas. Filed March 4, 1896.

JOHN S. SEYMOUR,
[E. B. MOORE.]*
Commissioner of Patents.

The amendment filed Nov. 24, 1896, has been considered. Clai 1 is rejected upon patent 347,216, Westcott, of record. In this pate the diaphragm is burstable under pressure and is composed of a fus ble material of such thickness and material (tin foil) as to allow th escape of the gas by both bursting and fusing.

Claim 2, line 2, should be amended to read *cylinder A to contai* etc., and line 4, after "valve *f*" insert *the valve being set to close a pressure below that at which the diaphragm will burst.*

Claim 3 should also be amended as suggested in connection wit claim 2, also to include the fusible diaphragm.

Claims 2, 3, 4, when amended as suggested may issue.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 581,842, Paper No. 6. Rejec. Dec. 29, 189

494 Room 39.

Applicants, E. N. Dickerson & J. J. Suckert. Invention, "Apparatu for Gasifying & Controlling Liquefied Acetylene Gas. File March 4, 1896. Serial No. 581,842.

Hon. Commissioner of Patents.

SIR: We amend this case as follows:
Erase claims 1, 2 and 3, and insert in lieu thereof:

[* Words and figures enclosed in brackets erased in copy.]

Substitute D[1], March 1, '97.

C. 1. The combination with a tank containing compressed or liquefied gas, of a burstable and fusible diaphragm of such thickness and material as that when the tank is heated, thereby both increasing the pressure of the gas and its temperature, the said diaphragm will fuse and burst at approximately the same pressure and temperature due to the excessive heating of the tank, substantially as described.

[Matter enclosed between rules erased in copy.]

2. The combination in a gas reducing apparatus, of a cylinder to contain compressed liquefied gas, a reducing valve connected to the cylinder, and a burstable and fusible diaphragm *f*, the valve being set to close at a pressure below that at which the diaphragm will burst, substantially as described.

3. The combination is a gas reducing apparatus, of a cylinder to contain compressed or liquefied gas, a reducing valve, a burstable and fusible diaphragm, a safety connection *s* and a connection *u* above the diaphragm or float of the reducing valve and communicating with the safety connection *s* which connection communicates with the atmosphere, substantially as described.

Claim 4, line 1, for the words "for containing" read *to contain*

These claims we think will avoid all the references. In claim 1 we have stated the invention clearly and in a manner which cannot possibly be said to be anticipated in the reference.

Respectively, FOSTER & FREEMAN,
Attorneys for Dickerson & Suckert.
(F.)

Washington, D. C., January 12, 1897.

Indorsed: U. S. Patent Office, Jan. 13, 1897, Division 31. Serial No. 581,842, Paper No. 7. Amendment C. Filed Jan. 13, 1897. Dickerson & Suckert.

495 Div. —, Room —.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Feb. 12, 1897.
Mailed Feb. 12, 1897.

Edward N. Dickerson and Julius J. Suckert, care of Foster and Freeman, City:

Please find below a communication from the Examiner in charge of your application, No. 581,482, Apparatus for Gasifying and Controlling Liquefied Acetylene Gas. Filed March 4, 1896.

JOHN S. SEYMOUR,
[E. B. MOORE.]*
Commissioner of Patents.

The amendment filed Jan. 13, 1897, has been entered and considered.

Claim 1 is held met by the patents of record for the reason already stated. This claim is substantially the same as heretofore considered, differing only in phraseology, and may be considered a second time rejected.

The remaining claims may issue.

ELY, *Ex.*

Indorsed: Serial No. 581,842, Paper No. 8. Rejec. Dated Feb. 12, 1897.

Room 39.

Applicants, E. N. Dickerson & J. J. Suckert. Invention, App. for Gasifying & Controlling Liquefied Acetylene Gas. Filed March 4, 1896. Serial No. 581,842.

To the Hon. Commissioner of Patents.

SIR: We amend this case as follows:
Page 4, at the end of line 7, insert:

D. 496 Thus, we find that a diaphragm which fuses at about 150° F. and which bursts at about two thousand pounds pressure will operate satisfactorily as a double safety diaphragm under the circumstances stated.

[* Words and figures enclosed in brackets erased in copy.]

Substitute for claim 1 the following:

D'. 1. The combination with a tank containing compressed or liquefied gas, of a diaphragm burstable at about two thousand pounds pressure and fusible at about 150° F., thereby providing a double safety diaphragm which will fuse and burst at approximately the pressure and temperature of the gas due to the excessive heating of the tank.

This claim, will, we think, avoid all objections to the case, and we trust it will receive early and favorable consideration.

Respectfully, FOSTER — FREEMAN,
Attorneys for Dickerson & Suckert.
(F.)

Washington, D. C., February 27, 1897.

Indorsed: U. S. Patent Office, Mar. 1, 1897, Division 31. Serial No. —, Paper No. 9. Amendment D. Filed March 1, 1897.

Serial No. 581,842.

Issue Division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., April 2, 1897.

Edward N. Dickerson and Julius J. Suckert, Assor., c/o Foster & Freeman Assoc., City.

SIR: Your application for a patent for an Improvement in apparatus for Gasifying and Controlling Liquefied or Compressed Gas filed Mar. 4 1896 has been examined and Allowed.

The final fee, Twenty Dollars, must be paid, and the Letters Patent bear date as of date not later than Six Months from the time of this present notice of allowance.

[On left margin:] In Remitting the Final Fee give the Serial Number at the Head of this Notice.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run, but to do this
497 properly applicants will be expected to pay their final fees at least Twenty Days prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, Distinctly and Plainly Written, the name of the Inventor and Title of Invention as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees:

If you desire to have the patent issue to Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of Specifications and Drawings will be charged for at the following rates: Single Copies, uncertified, 10 cents each. They money should accompany the order.

Very respectfully, JOHN S. SEYMOUR,
Commissioner of Patents.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

The within title is that given by the Examiner in charge as most appropriate to your invention. Should you desire a change in the same, satisfactory reason Must be given therefor on or before the payment of the final fee.

Amount Received, $20, C'k. Chief Clerk.

Memorandum of Fee Paid at United States Patent Office.

Serial No. 581,842,——, 18—, ——, 191–.

Inventor:
E. N. Dickerson and Julius J. Suckert.

498 Patent to be issued to
United States Acetylene Liquefaction Company.

Name of Invention, as Allowed:
Apparatus for Gasifying and Controlling Liquefied and Compressed Gas.

Date of Payment:
April 16, 1897.

Fee:
$20 Final.

Date of Filing:
March 4, 1897.

Date of Circular of Allowance:
April 2, 1897.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

E. N. DICKERSON, *Attorney.*

Send Patent to E. N. Dickerson, 253 Broadway, New York, N. Y.

Indorsed: U. S. Patent Office, April 17, 1897, Chief Clerk.

* * * * * * *

(Here follows a copy of the Letters Patent to Dickerson and Suckert, No. 582,274, May 11, 1897, which is omitted at this point for the reason that a copy of some appears at page 329 of this printed record.)

48. Gas,
Acetylene.

1896.

Contents.

½. Application, 1 papers. O. K.
1. Rejected, April 7, 1896.
2. Asso. power of att'y, Sept. 8, 1896.
3. Am'd't A, Oct. 2, '96.
4. Rejected, Nov. 3, 1896.
5. Amendment B, Nov. 24, '96.
6. Rejected, December 29, 1896.
7. Amendment C, Jan. 13, '97.
8. Rejected, Feb'y 12, 1897.
9. Amendment D, March 1, '97.

499 10.
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Title: Improvement in Apparatus for Gasifying and Controlling Liquefied or Compressed Gas.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

CLERK'S NOTE.—Defendants' Exhibit No. 33, (Translation of Exhibit No. 28) is not inserted here, for the reason that same appears on pages 273 to 278 of this transcript.

(DEFENDANTS' EXHIBIT No. 34.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Edmond Fouché, Assignor to E. Cornelius Benedict, John S. Seymour and Eugene Bournonville, Number 727,609, Granted May 12, 1903, for Improvement in Apparatus for Storage of Gases.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at City of Washington, this 1st day of March, in the year of our Lord one thousand
500 nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

No. 727,609.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Edmond Fouché of Paris, France has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Apparatus for Storage of Gases, he having assigned his right, title, and interest, in said improvement, to E. Cornelius Benedict, John S. Seymour and Eugene Bournonville, of New York, N. Y. a description of which invention is contained in the specification of which a copy is hereto annexed and made a part hereof, and has complied with the various requirements of law in such cases made and provided; and

Whereas upon due examination made the said claimant is adjudged to be justly entitled to a patent under the law;

Now therefore these Letters Patent are to grant unto the said E. Cornelius Benedict, John S. Seymour and Eugene Bournonville their heirs or assigns for the term of seventeen years from the twelfth day of May, one thousand nine hundred and three, the exclusive right to make, use, and vend the said invention throughout the United States and the Territories thereof.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twelfth day of May, in the year of our Lord one thousand nine hundred and three and of the Independence of the United States of America the one hundred and twenty-seventh.

[SEAL.] F. I. ALLEN,
Commissioner of Patents.

(Here follows diagram marked pages 501 and 502.)

No. 727,609. PATENTED MAY 12, 1903.

501

E. FOUCHÉ.

APPARATUS FOR STORAGE OF GASES.

APPLICATION FILED MAY 24, 1901.

NO MODEL.

Fig. 1

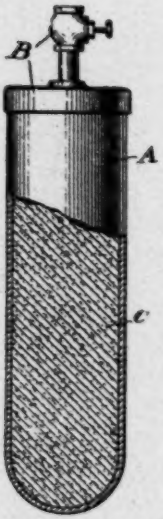
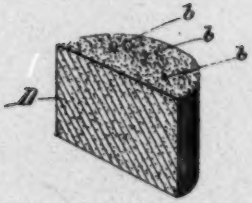


Fig. 2



Witnesses
H. J. Ravier
F. D. Klein

Inventor
Edmond Fouché
By his Attorneys
Rynnon, Rynnon & Klein

No. 727,609. Patented May 12, 1903.

UNITED STATES PATENT OFFICE.

EDMOND FOUCHÉ, OF PARIS, FRANCE, ASSIGNOR TO E. CORNELIUS BENEDICT, JOHN S. SEYMOUR, AND EUGENE BOURNONVILLE, OF NEW YORK, N. Y.

APPARATUS FOR STORAGE OF GASES.

SPECIFICATION forming part of Letters Patent No. 727,609, dated May 12, 1903.

Application filed May 24, 1901. Serial No. 61,726. (No model.)

To all whom it may concern:

Be it known that I, EDMOND FOUCHÉ, a citizen of France, residing at Paris, France, have invented certain new and useful Improvements in Apparatus for the Storage of Gases, of which the following is a specification.

The object of my invention is to provide a receptacle for the storage of explosive or inflammable gases and such a filling therefor that in the event of an explosion or the ignition of a portion of the gas only a small volume will be affected, whereby danger from explosion is avoided.

In the drawings forming part of this specification, Figure 1 is a section of my improved receptacle. Fig. 2 is a view showing one form of the porous substance used therein.

A is the receptacle, which is made of any suitable material, such as steel, of sufficient strength to resist the pressure at which the gas is stored. This vessel is provided with a closure B of any suitable or desired kind. The receptacle A is filled with a porous substance C. Many different substances may be used, such as asbestos, mineral wool, carbon, pumice-stone, and ceramic materials. One substance which I find very advantageous for this use is porous brick. For the best results the material should be of such a character that were it reduced to powder it would occupy from twenty to twenty-five per cent. only of the space it occupies in its normal condition. In using porous brick of this kind or similar material I may form in the brick numerous small bores or perforations *b* for the purpose of facilitating the permeation of gas through the porous substance.

In preparing my receptacle for the storage of the gas in compressed form I saturate the porous substance with some solvent of the gas—as, for instance, in storing acetylene gas I would saturate the porous substance with acetone.

By "saturated" I mean that the amount of solvent used must be such that the danger from liquid expansion is avoided.

If the gas is to be charged under a pressure sufficient to liquefy it, it is forced into the receptacle by a suitable apparatus until the liquefying pressure is reached. The liquefied gas will permeate the porous substance and be held there in numerous small and partially-isolated charges.

In case the solvent is to be used the porous substance is ordinarily first saturated with the solvent. The gas is then forced in and through the pores in the filling material. The gas will then circulate through the pores of the filling material, come in contact with the solvent liquid, and be absorbed thereby.

By this apparatus explosive or inflammable gases of any kind may be stored without danger from explosion. The explosion will be confined to the inconsiderable amount stored in one, or at most in few, of the cells and would not be communicated to the body of stored gas. It is particularly useful in the storing of acetylene gas either in its compressed form or as a liquid or dissolved in a suitable solvent.

It is desirable that the filling substance be an integral mass; but I may employ a number of blocks of the porous material and completely fill the receptacle with the same, or I may partly fill the receptacle with blocks and pack them round with fibrous or granular filling.

What I claim, and desire to secure by Letters Patent, is—

1. An apparatus for storing gas consisting of a receptacle filled with a porous substance, such porous substance being saturated with a solvent of the gas to be stored, substantially as described.

2. An apparatus for storing gas consisting of a receptacle filled with porous material molded to fit the interior thereof, substantially as described.

Signed at Paris, France, this 29th day of April, 1901.

EDMOND FOUCHÉ.

Witnesses:
HENRY B. LOOMIS,
HERBERT J. LILLIE.

03 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 35.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

'o all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Bound 'olume of the Library of this Office of the Specification in the matter f the German Letters Patent to Dr. H. Loesner, Dated December 13, 894, Number 82,437, Verfahren zur Isolirung von Chlor aus Gas- emischen; also a copy of a Translation of said Specification made by ıe Official Translator.

Said Patent received in the Library August 3, 1895.

In Testimony Whereof I have hereunto set my hand and caused ıe seal of the Patent Office to be affixed at the City of Washington, ıis 2nd day of May, in the year of our Lord one thousand nine hun- red and eleven and of the Independence of the United States of ımerica the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

Kaiserliches Patentamt.

Ausgegeben Den 5, Juli 1895.

Kaiserliches Patentamt.

Patentschrift Nr. 82,437.

Klasse 75: Soda, Sowie Die Ubrige Chemische Grossindustrie.

Dr. H. Loesner in Leipzig.

Verfahren sur Isolirung von Chlor aus Gasemischen.

Patentirt im Deutschen Reiche vom 13 Dezember, 1894 ab.

Die vorliegende Erfindung besteht in einen Verfahren, um Chlor, elches mit anderen Gasen gemengt ist, zu isoliren, worauf es com- primirt oder zu anderen Reactionen verwendet werden kann.

04 Wie bekannt, ist es unmöglich, das Chlor, welches beim Deacon—und ahnichen Processen gewonnen wird, zu com- rimiren, weil es zu stark mit anderen gasen, gewöhnlich Stickstoff, erdünnt ist. Es hat sich nun gezeigt, dass eine grosse Anzehl von rganischen Körpern die Fähigkeit besitzt, Chlor bei Gewöhnlicher emperatur zu absorbiren, um es bei höherer wider abzugeben, ohne ch dabei im geringsten zu verandern.

Ein solcher Körper ist Z. B. o-Nitrotoluol. Dasselbe absorbirt hon bei gewöhnlichem Druck Chlor bis zu 11 pCt. und mehr und

giebt es bei höherer Temperatur oder Druck-verminderung wieder ab. Die Absorptionsfähigkeit kann durch Erhöhung des Druckes sowohl, als durch Erniedringung der Temperatur bedeutend erhöht werden. Es ist ganz gleichgiltig, ob man chemisch reines Nitrotoluol oder ein Gemenge mit seinen Isomeren anwendet.

Ebenso wie Nitrotoluol verhalten sich Nitrobensol, die Nitrosylole, die Nitrocumole, Chlorbensol, Brombensol, die Chlortoluole, Bromtoluole, ferner Chloroform, Tetrachlorkohlenstoff, Monochloressigsäureäthy lester, flüssige Paraffine, kurz, fast alle flussigen organischen Körper, welche bei gewöhnlichem Druck und gewöhnlicher Temperatur, sowie bei schwachem Erwärmen von Chlor nicht angegriffen werden.

Feste Körper, wie p-Nitrotoluol, Dischlor-, Dibrom-, Trichlor-, Tribrom-Bensole besw. Toluole und andere feste Körper nehmen bei gewöhnlicher Temperatur kein Chlor auf.

Das Verfahren, um Chlor aus seinen Gemengen mit Gasen zu isorliren, gestaltet sich nach Feststellung dieser experimentellen Thatsachen höchst einfach, indem das Gasgemenge durch irgend eins der erwähnten Absorptionsmittel zweckmässig unter Kühlung geleiter wird. Es können hierbei alle die technischen Methoden Vermendung finden, welche eine vollständige Ausnutzung des Absorptionsmittels gestatten, und ist die Form des Apparates den jeweilgen Versuchsbedingungen anzupassen.

Aus den so hergestellten Chlorlösungen gewinnet man durch Erwärmen oder durch Druckverminderung reines Chlorgas, welches comprimirt oder zu sonsteigen Zwecken vermendet werden kann.

Patent-Anspruch.

1. Ein Verfahren, um Chlor aus Gasgemengen zu isoliren, darin bestehend, dass man die chlorhaltigen Gasgemenge durch flüssige organische Körper leitet,, welche bie gewöhnlichem Druck und gewohnlicher Temperatur von Chlor nicht angegriffen werden, und aus diesen Lösungen das Chlor durch Erwärmen oder Druckverminderung wieder abscheidet.

505 2. Die specielle Ausführungsform dieses Verfahrens unter Ansendung von Nitrobenzol, Nitrotoluol, Nitroxylol, Nitrocumol, Chlorbenzol, Chlortoluol, Brombensol, Bromtoluol, Chloroform, Tetrachlorkohlenstoff, flüssigen Paraffinen, Monochloressigsäuereäthey lester.

Translation.

Kaiserliches Patentamt.

Patentschrift.

Klasse 75: Soda, Sowie die Ubrige Chemische Grossindustrie.

Translation.

Dr. H. Loesner, in Leipzig.

Process for Separating Chlorine from Gaseous Mixtures.

Patented in the German Empire from December 13, 1894; Published July 5, 1895.

This invention consists in a process for separating chlorine from other gases with which it is mixed, after which it is susceptible of being compressed or used for other reactions. It is a known fact that chlorine can not be compressed when obtained by the Deacon or similar processes, for the reason that it is too much diluted with other gases, usually nitrogen. It has been found that a large number of organic bodies possess the faculty of absorbing chlorine at normal temperature, giving it off again at higher temperature, without being in the least affected by it.

Such a body is, e. g., o-nitrotoluole. Even at normal pressure this body absorbs chlorine to the amount of 11% and above and gives it off again at higher temperature or reduced pressure. The faculty of absorption may be considerably augmented by increasing the pressure or reducing then temperature. It is wholly immaterial whether chemically pure nitrotoluole is used for this purpose or a compound with its isomeres.

The following bodies behave in the same manner as nitrotoluole; Nitrobensole, the nitroxyloles, the nitrocumoles, chlorbensole, brombensole, the chlortoluoles, the bromtoluoles, also chloroform tetrachlorhydrocarbon, monochlor-acetic-acidethylester, liquid paraffins,—in

a word, nearly all liquid organic bodies which at normal pressure and normal temperature as also when slightly heated are not affected by chlorine.

Solid bodies such a p-nitrotoluole, the dichlor, dibrom- and tribrom-bensoles and toluoles, and other solid bodies do not absorb chlorine at normal temperature.

506 After these experimental facts have been determined, the process for separating chlorine from the gases with which it is mixed becomes very simple, the gaseous mixture being passed through one of the absorbing agents referred to, preferably while being cooled. In this connection any of the technical methods may

be employed which admit of fully utilizing the absorbing agent, and the form of the apparatus should be suited to the experimental condition in each case.

From the chlorine solutions thus obtained pure chlorine is won by heating or by reduction of the pressure, and such gas may then be compressed or used for other purposes.

Claims.

1. A process for separating chlorine from gaseous mixtures, consisting in the fact that the gaseous mixture containing chlorine is passed through liquid organic bodies which at normal pressure and normal temperature are not affected by chlorine, and that from such solutions the chlorine is separated again by heat or by reduction of pressure.

2. The special embodiment of this process, using nitrobenzole, nitrotoluole, nitroxylole, nitrocumole, chlorbenzole, chlortoluole, brombenzole, bromtoluole, chloroform, tetrachlorhydrocarbon, liquid paraffins, monochlor-acetic acid-ethylester.

N. E. K.
4-25-11.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT No. 36.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This it to Certify that the annexed is a true copy of an Extract from the title Page, also copy of Page 164 of a Bound Volume in [*in*] the Library of this Office entitled:

L'incandescence Par Le Gaz & Le Pétrole.
L'Acétylène.
Et Ses Applications.
By F. Dommer, Paris.

Said volume received in the Library January 26, 1887.
507 Attached, hereto, is a copy of a Translation of said Extracts made by the Official Translator.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 12th day of May, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

L'Incandescence Par Le Gaz & Le Pétrole.
L'Acétylène.
Et Ees Applications.
Par F. Dommer.

Page 164.

La présence de l'hydrogène sulfuré est due aux traces de sulfate de chaux contenues dans la chaux employée, et aux pyrites contenues dans la houille.

Propriétés de l'Acétylène.

L'Acétylène est un gas incolore, ayant une odeur fortement alliacée. D'après M. Moissan l'acétylène pur aurait une odeur éthérée agréable; cette odeur alliacée provien drait de l'emploi de houille et de chaux impures, et de la présence, dans le calcium, de sulfure et de phosphure de calcium.

L'acétylène contient 92.3 pour 100 de carbone et 7.7% d'hydrogène; sa chaleur de formation, en partant du carbone amorphe, est de 51.5 calories, so chaleur de combustion de 318 calories.

L'eau, le sulfure de carbone dissolvent environ leur volume de gaz acétylène. A 0° et sous la pression de 4.65 atmosphères, le coefficient de solubilité est égal a 1.6; le pétrole d'éclairage en dissout 1½ volume, l'essence de térébenthine 2 volumes, le chloroforme, la benzine 4 volumes, l'alcool absolu et l'acide acétique près de 6 volumes; 100 volumes d'eau saturée de sel marin ne dissolvent que 5 volumes de gaz.

La densité de l'acétylène est 0.91, le poids du litre est de 1,169 grammes, son volume spécifique, 855 litres par kilo, sa température critique 37°, et sa pression critique 68 atmosphères.

Action de la chaleur. o Soumis à l'action de la chaleur, dans une cloche courbe, il donne divers produits polyméres de con-
508 densation, parmi lesquels le principal est la benzine C^6 H^6; du styrolene C^8 H^8, de la naphtaline C^{10}, H^8, de l'anthracène C^{14} H^{10} et du rétène C^{18} H^{18}.

Translation from L'Incandescence Par Le Gaz & Le Pétrole.

L'Acétylène et ses Applications.

By F. Dommer.

Extract, p. 164.

The presence of sulfurated hydrogen is due to the traces of sulfate of lime contained in the lime used, and to the pyrites contained in the coal.

Properties of Acetylene.

Acetylene is a colorless gas, having a strong odor of garlic. According to Mr. Moissan, pure acetylene has a pleasant odor of ether,

this garlic odor coming from the use of impure coal and lime, and from the presence of calcium sulfide and phosphide in the calcium carbide.

Acetylene contains 92.3% of carbon and 7.7% of hydrogen; its heat of formation, starting from the amorphous carbon, is 51.5 calories; its heat of combustion, 318 calories.

Water and cabron sulfide dissolve about their volume of acetylene gas. At 0° and under a pressure of 4.65 atmospheres, the coefficient of solubility is equal to 1.6; illuminating petroleum dissolves 1½ times its volume, essence of turpentine twice its volume, chloroform and benzine 4 times their volume; absolute alcohol and acetic acid nearly 6 times their volume; 100 volumes of water saturated with sea salt dissolve only 5 volumes of gas.

The density of acetylene is 0.91; its weight per liter is 1.169 grams; its specific volume, 855 liters per kilogram; its critical temperature, 37°; its critical pressure, 68 atmospheres.

Action of heat. When subjected to the action of heat in a bent glass-tube, it yields various polymeric products of condensation, the chief one among which is benzene $C^6 H^6$; styrol $C^8 H^8$, napthalene $C^{10} H^8$, anthracens $C^{14} H^{10}$, and retene $C^{18} H^{18}$.

N. E. K.
5-10-11.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

509 (DEFENDANTS' EXHIBIT No. 37.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy of an Extract from Page 29, of a Bound Volume of the Library of this Office entitled:

Commerial Organic Analysis.
By Alfred H. Allen.
Third Edition.

Volume II, Part II.

Philadelphia.
1900.

Said Volume received in the Library May 24, 1900.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 4th day of August, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-sixth.

[SEAL.] C. C. BILLING,
First Assistant Commissioner of Patents.

Extract from Page 29.

Water dissolves about 1.1 times its volume, but a saturated solution of common salt dissolves only about 0.05 volumes. Alcohol dissolves about 6 volumes and paraffin about 2.5; acetone dissolves a large amount.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

CLERK'S NOTE.—Defendants' Exhibit No. 38, Sample of Needle Valve is not inserted here, for the reason that same is a physical exhibit and is transmitted to the Clerk of the United States Circuit Court of Appeals for the Eighth Circuit with this transcript.

(DEFENDANTS' EXHIBIT NO. 39.)

510

UNITED STATES OF AMERICA.
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the File Wrapper and Contents, in the matter of the Letters Patent of George Marie Auguste Claude and Georges Albert Hess, Assignors to Bruno Abdank-Abakanowicz, Number 664,383, granted December 25, 1900, for Improvement in Apparatus for Storing and Distributing Acetylene Gas.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this ninth day of December, in the year of our Lord one thousand nine hundred and ten and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.]

F. A. TENNANT,
Assistant Commissioner of Patents.

(Serial Number) 625,580.

(Ex'r's Book) —.

Patent No. 664,283.

Georges Marie Auguste Claude and Geo. Albert Hess, Ass'ors to Bruno Adbank Abakanowicz, of Parc Saint Maur France,
Of Saint Mande and Paris,
County of ——,
[State]* of France.

Invention: Apparatus for the Storage & Distribution of Acetylene Gas.

[* Words and figures enclosed in brackets erased in copy.]

Parts of application filed.
Petition, ——, 190–.
Affidavit, ——.
Specification, ——.
Drawing, ——.
Model, ——.
Specimen, ——.
First fee, cash, ——, 190–.
First fee, cert., ——, 190–.
App. filed complete ——.

Old wrapper, with record of actions inside.

—— ——, Examiner.
Countersigned: —— ——,
For Commissioner.
Notice of allowance, ——, 190–.
Final fee, cash, ——, 190–.
Final fee, cert., ——, 190–.
Patented, ——, 190–.

511 (Serial Number) 625,580. Div. 31.

189–.

Patent No. 664,383.

Georges Marie Auguste Claude[1] and Georges Albert Hess[2], Ass'rs to Bruno Abdank-Abakanowicz[1], of Parc Saint Maur[2], of [Saint]* Mandé and Paris, France,
County of ——,
[State of]* France.
Invention: Apparatus for the Storage and Distribution of Acetylene Gas.

Parts of application filed.
Petition, Mar. 1, 1897.
Affidavit, Mar. 1, 1897.
Specification, Mar. 1, 1897.
Drawing, Mar. 1, 1897.
Model. Not reg'd.
Specimen Blue prints.
First fee, cash, $15, Mar. 1, '97.
First fee, cert., ——.
App. filed complete Mch. 1, '97.

2. ——.
Examined June 14, 1900. G. S. Ely, Ex'r.
Countersigned: J. W. Babso[illegible],
For Commissioner.
6-17-1900.
Notice of allowance, June 16, 1900.
Final fee, cash, $20, Dec. 1, 1900.
Final fee, cert., ——, 189–.
Patented December 25, 1900.
Dodge & Sons, Asso., City.
Jos. P. Livermore, Boston, Mass.
Dec. 1, 1900.
3. Amount Received, $15, c'k. Chief Clerk.

[* Words and figures enclosed in brackets erased in copy.]

Commissioner of Patents:

Your petitioners, Georges Marie Auguste Claude, and Georges Albert Hess, citizens of the Republic of France, residing re-
512 spectively in Saint Mandé, France, and Paris, France, pray that Letters Patent may be granted to them for the Apparatus for the Storage and Distribution of Acetylene Gas set forth in the annexed specification; and they hereby appoint Joseph P. Livermore, of Boston, Massachusetts, their attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the Patent, and to transact all business in the Patent Office connected therewith.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT HESS.

Specification.

To all whom it may concern:

Be it known that we, Georges Marie Auguste Claude, [a citizen of the Republic of France],* residing at [Saint]* Mandé, France, and citizens of the Republic of France,
Georges Albert Hess, [a]* residing at Paris, France, ∧ have invented an improvement in Apparatus for the Storage and Distribution of Acetylene Gas, of which the following description in [*connected*] with the accompanying drawings is a specification, like letters on the drawings representing like parts.

Subst. F'.

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1 The present invention relates to an apparatus for the stor-
2 age and distribution of acetylene gas adapted to be used in
3 accordance with the method described by us in another applica-
4 tion filed herewith, which method consists in forcing acetylene
5 gas under pressure into a liquid which is a solvent thereof, and
6 maintaining such gas in solution for the purpose of delivering
7 the same to consumers for consumption.

[Matter enclosed between rules erased in copy.]

8 To this end the apparatus embodying the present invention
9 consists essentially in a closed receptacle containing acetylene
10 gas in solution having an outlet for the gas, so positioned
11 as to be normally above the level of said solution and adapted
513
12 to be provided with a burner or connected with a pipe system for
13 the final use or distribution of the gas which escapes from the
14 solution owing to the diminution of pressure when the said out-
15 let is opened.

[* Words and figures enclosed in brackets erased in copy.]

It is desirable, moreover, that the receptacle which contains the liquid solvent should be conveniently arranged for the charging process as well as for the discharging process, and to that end the said receptacle is shown as consisting of a fluid tight vessel having an inlet as well as the outlet, the mouth of said inlet being extended below the surface of the solvent liquid, so that gas introduced through the same will pass through the liquid to aid in the solution of said gas. The inlet and outlet passages are provided with suitable valves or cocks to close the same after the receptacle is charged with gas, and when it is not in use.

It is further desirable for the proper operation of the burners supplied in this way, that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet, whereby the gas is allowed to escape there through at substantially uniform pressure, a reducing valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use.

Fig. 1 is a vertical cross section of the apparatus embodying the invention; and Fig. 2 an elevation showing a modification. The receptacle or closed vessel *a* is provided with an

514

inlet tube *a*2 having a suitable coupling *a*3 for connecting the same to the gas supply pipe A, shows as provided with a controlling valve A2 whereby the gas supply may be turned on after the receptacle *a* is coupled to the pipe A and turned off after the said receptacle is properly charged, the said inlet tube being also provided with a valve or cock *a*4. Contained within the

such as alcohol or acetone

July 9, '97. reservoir is a fluid *b* ∧ capable of dissolving acetylene gas

July 17, '97.

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in

accordance with the method set forth in our other application above referred to.

[Matter enclosed between rules erased in copy.]

In order to facilitate the process of solution the tube *a*2 is shown as extending downward nearly to the bottom of the receptacle *a*

so that the gas is admitted at a point near the bottom thereof and rises through the liquid as it enters.

To discharge the gas from the said receptacle *a*, the upper portion thereof has an outlet passage *c* provide with a coupling

$c2$ for the purpose of connecting it to the pipe system leading to the burners which are to be supplied, or to a single burner; and a valve $c3$ adapted to be opened after the receptacle is properly coupled for use.

In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure (the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom) a reducing valve d of any suitable or usual construction is interposed between the

515

interior of the receptacle and the outlet c therefrom. As herein shown, the said reducing valve is in a passage $d2$ connecting the spaces below and above a wall or partition $d3$ near the upper portion of the receptacle a, the dissolved acetylene being contained in that portion of the receptacle which is below the said partition, the portion above being normally empty and forming a reservoir for the gas at low pressure which has passed into said reservoir through the said reducing valve. In order that the reducing valve d may be set or adjusted to respond to any desired pressure the vessel a is shown as provided with a removable plug $d4$ through which access may be had to the adjusting stem $d5$ of said valve.

It is obvious that through the agency of the reducing valve the pressure in said upper reservoir will be substantially uniform so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted.

When the gas storing apparatus is to be connected with supply pipes for distribution throughout a building, it is desirable to duplicate the apparatus, as shown in fig. 2, and by setting the reducing valve letter $d10$ of one receptacle to respond to a slightly lower pressure than that of the reducing valve $d20$ of the other receptacle, the receptacle having its valve set for lower pressure will not begin to deliver gas until the contents of the other receptacle are substantially exhausted, after which

516

the one having its reducing valve set for lower pressure will begin to deliver its contents.

In this instance, the reducing valves may be placed at the exterior of the vessels, the passages from the lower to the upper chambers thereof being formed in the tubes $d200$; and said valves are shown as provided with adjusting handles $d12$ and $d22$, whereby they may be readily set as above described. The two receptacles are shown as connected with a main pipe B, through

branch pipes B2, each of which has a valve or cock B3 to prevent the escape of gas while either receptacle is being changed.

A pressure gauge *e* may also be supplied for each receptacle to indicate the pressure of the gas contained in solution, and thus to show at a glance when one of the reservoirs is empty and the other is beginning to be drawn upon. At or after this time a charged receptacle may be substituted for the empty one and its reducing valve set at a slightly lower pressure than that of the one which is then partially discharged.

By this plan it is possible to use up substantially the whole charge of each reservoir without danger of failure of the supply.

It may in some cases be desirable to provide each apparatus with a burner, so that said apparatus in itself constitutes a lamp; or to provide lamp burners in conjunction with which the apparatus may be used as a detachable fount.

It is not intended to limit the invention to the specific construction herein shown since modifications may obviously be made.

517 Substitute E [B],* Sept. 17, '97.

Claims.

Insert A, July 9, '97.

1. In A closed vessel, [containing]* a liquid which is a solvent of acetylene contained in said Vessel, an inlet to said vessel adapted to be connected to a source of acetylene under pressure, an outlet therefrom adapted to deliver gas for consumption, and a reducing valve interposed between the interior of said receptacle and said outlet, substantially as described.

2. The combination with a closed receptacle [adapted to Contain]* of a liquid which is a solvent of acetylene gas, [of]* contained therein an inlet tube for the introduction of acetylene gas having its inlet opening near the bottom of said receptacle, an outlet opening at or near the top of said receptacle adapted to be coupled to a pipe

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[* Words and figures enclosed in brackets erased in copy.]

system or burner, a valve controlling said outlet, and a reducing valve interposed between the main portion of said receptacle and said outlet, substantially as described.

3. The herein described apparatus which comprises a closed vessel, [containing]* a solution of acetylene under pressure greater than normal atmospheric pressure, ^ contained therein an outlet for the gas given up from the said solution, and means for controlling said outlet whereby the gas escapes there through at substantially uniform pressure, substantially as described.

[Matter enclosed between rules erased in copy.]

In Testimony Whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT HESS.

Witnesses:
1. EDWARD P. MacLEAN.
2. MAURICE H. PIGNET.

518 REPUBLIC OF FRANCE,
City of Paris, ss:

Georges Marie Auguste Claude, and Georges Albert Hess, the above named petitioners, citizens of the French Republic, and residing respectively at Saint-Mande, and Paris, France, being duly sworn depose and say that they verily believe themselves to be the original first and joint inventors of the Improved Apparatus for the Storage and distribution of Acetylene Gas described and claimed in the foregoing specification, that the same has not been patented to them, or to others, with their knowledge or consent in any country; that the invention has not to their knowledge been in public use or on sale in the United Stattes for more than two years prior to their application, and that they do not know and do not believe that the same was ever known or used prior to their invention thereof.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT HESS.

Sworn to and Subscribed before me this eleventh day of February A. D. 1897.

[CONSULAR SEAL.] E. P. MacLEAN,
United States Vice & Deputy Consul-General.

Indorsed: U. S. Patent Office, Mar. 2, 1897, Division 31. U. S. Patent Office, Mar. 1, 1897, Chief Clerk. Serial No. 625,580, Paper No. ½. Application. Filed March 1, 1897. Marie, Claude, Hess.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., April 6, 1897.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage
519 and Distillation of Acetylene Gas. Filed March 1, 1897.

JOHN S. SEYMOUR,
[E. B. MOORE.]*
Commissioner of Patents.

The above case has been considered.

Page 3, line 10 a fluid capable of dissolving the acetylene, such as employed by applicant should be stated.

In claims 1 and 3 liens 1 and 2 respectively should be amended by cancelling the word "containing" and inserting *constructed to contain.*

The claims are each rejected upon patents 577,989, Schulke, March 2, 1897, (Distribution, Regulating Pressure); 567,764, Dixon, Sep. 15, 1896; (Holders); 394,018, Saunders and Patton, Dec. 4, 1888, (Distribution, Regulating Pressure); British patent 22,183, Gearing, Nov. 16, 1894, (Acetylene); 9901; Abel, July 14, 1887, (Gas Distribution) and German Patent 58,927, Webb, Sept. 21, 1891, (Holders). In each of these patents is shown a tank in which gas is caused to pass under pressure and a regulator located within said tank or between said tank and burners for regulating the pressure of the gas to the burners.

ELY.

STOKES.

Indorsed: Serial No. 625,580, Paper No. 1. Rej. Dated April 6, 1897.

[* Words and figures enclosed in brackets erased in copy.]

Room 39.

Application of Georges M. A. Claude & Georges A. Hess for Letters Patent. Serial No. 625,580. Filed March 1, 1897. Apparatus for Storing Acetylene Gas for Distribution.

Hon. Commissioner of Patents.

SIR: In the above matter I amend as follows:

Page 3, line 10 after the reference letter "*b*" insert,—*such as alcohol or acetone.*

Claim 1 line 1 at the beginning of the line erase "A" and insert,

Canceled Sept. 17, '99.

A. —The herein-described apparatus for the storage and distribution of acetylene, which comprises a

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[Matter enclosed between rules erased in copy.]

Same line after "vessel" insert a *comma* and cancel the word *"containing"*.

Line 2 after *"acetylene"* insert,—*contained in said vessel.*

520 Claim 2 line 1 erase "adapted to contain" and insert,—*of*

Line 2 after *"gas"* insert,—*contained therein.*

Same line erase *"of"*

Claim 3 line 2 insert a *comma* after "vessel" and erase "containing"

Line 3 after "pressure" insert—*contained therein.*

As understood by applicants the Examiner's rejection of the claims in the above entitled application is based upon claims as they would read if the word "containing" in claims 1 and 3 were cancelled and the words "constructed to contain" inserted, and the liquid were not included as an element of the apparatus. It is submitted, however, that a liquid may and in this case does constitute a substantial portion of the apparatus, and that the invention should not be regarded merely as a double use of a vessel to contain a liquid? The applicants had no intention of claiming as novel the vessel constructed to contain a liquid, but what they do claim is an apparatus for the storage and distribution of gas which comprises not only a vessel but also a liquid contained therein and having a specified property, the said liquid forming an essential part of the apparatus which would be inoperative so far as the present invention is concerned without the said liquid. In other words, the liquid is a distinct element in the apparatus and so far as relates to the references which have been found, is a novel element and one which is thought to render the whole combination a patentable one.

In the use of the apparatus the liquid remains intact, and, in fact, is an essential part of the storing apparatus, the gas being dissolved in the liquid which in the use of the apparatus gives it up, itself re-

maining behind and forming a part of the apparatus just as the vessel which contains it forms a part of the apparatus.

After the gas is exhausted, the apparatus may be recharged without removing or renewing the liquid, and it is obvious that without the liquid the apparatus would not be an embodiment of the invention as stated, nor would it be of any use as a storage apparatus for the purpose for which the invention is intended. It is submitted, therefore, that in the absence of any reference which discloses a vessel and a liquid contained therein and adapted to receive and dissolve a gas and to give up the said gas without giving up the liquid in the operation of the apparatus, the claims as now amended set forth an apparatus which is novel and useful, and reconsideration of the claims is accordingly requested.

521 As an illustration of an apparatus in which a contained liquid as well as the vessel containing it is an essential operative element of the apparatus, a mercurial thermometer, or barometer may be mentioned, and attention is called to the fact that in applicants' invention the vessel and liquid constitute the apparatus and the gas in the material operated upon thereby, while in the references a vessel or tank alone is the apparatus, and when used for acetylene is many hundred fold less efficient than applicants' apparatus for the purpose for which it is designed.

For the foregoing reasons reconsideration is requested.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude & Hess.

July 7, 1897.

Indorsed: U. S. Patent Office, Jul- 10, 1897, Division 31. United States Patent Office, Jul- 9, 1897. Serial No. 625,580, Paper No. 2. Amend't A. Filed July 9, 1897. Claude & Hess.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Aug. 23, 1897.
Mailed " " "

Georges Marie August Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897.

BENJ. BUTTERWORTH,
[E. B. MOORE.]*
Commissioner of Patents.

[* Words and figures enclosed in brackets erased in copy.]

The above case has been reconsidered in view of amendment of July 9, 1897.

Page 4, line 10, beginning with the word "in" cancel to the end of line 12. Pending applications are not open to the public for inspection and it cannot be assumed that applicants' co-pending case will mature into a patent.

522 In connection with the claims the liquid solvent is not a structural element to be placed in a mechanical combination. This is covered by and a part of the process. The claims cover simply a vessel having an inlet, an outlet and a reducing valve placed in the outlet. Claim 2 includes the burner. This is fully and clearly shown in the patents cited and the claims are again rejected.

D. J. KELLY, *Ac't'g E.*

STOKES.

Indorsed: Serial No. 625,580, Paper No. 3. Rejec. Dated Aug. 23, 1897.

Room 39.

Application of Georges M. A. Claude & Georges A. Hess for Letters Patent. Serial No. 625,580. Filed March 1, 1897. App. for the Storage and Distribution of Acetylene Gas.

Hon. Commissioner of Patents.

SIR: In the above matter I amend as follows:

3

Page [4],* *line 10 insert the period after "gas" and cancel the word "in"*

Cancel lines 11 and 12.

Cancel the claims and substitute therefor the following:

Subst. D.

[B.]* 1. A solution of acetylene contained in a closed vessel under pressure sufficient to maintain an excess of the gas dissolved, and means for permitting the excess of acetylene to escape from said solution by relieving or lowering said pressure, substantially as described.

[Matter enclosed between rules erased in copy.]

Substitute C.

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2. A vessel containing a solution of acetylene under pressure sufficient to maintain an excess of the gas dissolved, an outlet therefrom to permit the excess of acetylene to escape, and a reducing valve interposed between said outlet and said solution, substantially as described.

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

Subst. D.

[B.]* 3. A closed vessel, a solvent of acetylene contained therein and adapted to receive a super-saturated solution of acetylene produced by forcing acetylene into the solvent under pressure, an outlet for the excess of acetylene which escapes from the solvent when the pressure is relieved or reduced, and means for controlling said outlet whereby the gas escapes there through at substantially uniform pressure, substantially as described.

[Matter enclosed between rules erased in copy.]

523 The claims as now presented are believed to set forth applicants' invention more clearly than the original claims, and reconsideration is respectfully requested.

It is submitted that the liquid solvent is clearly and unmistakably an element and the essential element of the apparatus, and that the solution of acetylene is the essential element of claims 1 and 2. It is not seen, moreover, how the liquid solvent can be covered by and a part of the process as stated by the Examiner. The process consists essentially in forcing into a liquid solvent of acetylene an excess of the gas by subjecting the gas to pressure, and then keeping the said excess in solution by maintaining the pressure. The solvent itself has no more to do with the process than has any other piece of apparatus which may be utilized in carrying out a process.

The device as a whole as set forth in the present application is clearly a novel and useful article of manufacture, capable of use in connection with lighting or heating by means of acetylene gas. The solution of gas is just as clearly a structural element of the device as is the brimstone at the end of a match, or the liquid in a hand-grenade fire-extinguisher, or the explosive in a cartridge. Patents have been granted frequently for these and similar articles with the parts analogous to applicants' solution named in the claims as structural elements. In fact it would be manifestly absurd to attempt to frame a claim in any other way. Taking, for example, claim 1 in patent No. 297,075, Harden, April 15, 1884, which reads as follows: "1. As an improvement in hand-grenade fire-extinguishers, the combination of the frangible walls of the grenade with the contained fire-extinguisher solution, and with movable solid bodies applied within the grenade, substantially as described." and applying the view expressed by the examiner in the present case, the claim should read; As an improvement in hand grenade fire-extinguishers, a receptacle having frangible walls adapted to contain fire-extinguishing solution and movable solid bodies, substantially as described. Clearly the claim in such a way would cover any ordinary glass bottle, and should be rejected on that ground. On the con-

[* Words and figures enclosed in brackets erased in copy.]

trary, the claim as drawn and granted covers a combination, presumably novel, the elements of which are the frangible walls; and the fire-extinguishing solution; and the movable solid bodies contained within the said walls.

As another illustration, the Edison Electric Incandescent Lamp patent No. 223,898 has as its second and broadest claim, "The combination with carbon filaments of a receiver made entirely of glass, and conductors passing through the glass and from which re-
524 ceiver the air is exhausted, for purposes set forth." In this claim the vacuum may clearly be looked upon as a structural element without which the lamp would be inoperative. In the present application claims 1 and 2 set forth as an article, a solution of acetylene contained in a closed vessel under pressure in order to maintain an excess of the gas dissolved, together with means for utilizing the excess of gas when the pressure is relieved. Without that which may be called the super-saturated solution of acetylene gas, the apparatus would be as incomplete as a cartridge without pow-er and ball, a lucifer-match without a substance adapted to be ignited by friction, an incandescent lamp without its vacuum bulb, or a galvanic battery without its exciting solution.

If the references upon which the Examiner relies may be properly held to anticipate applicant's invention, an ordinary glass bottle should anticipate the claim in the hand grenade patent above named, or a stick of kindling wood should preclude novelty in the case of a lucifer match.

In regard to claim 3, if the liquid solvent of acetylene were omitted, the apparatus would be as useless as the incandescent lamp without its bulb.

It does not appear that precisely the point raised by the examiner has been made primarily the subject of consideration by the courts. There are however decisions which show that a matter not necessarily a permanent part of the tangible structure was regarded as an element of the combination.

In the incandescent lamp case (47 Fed. Rep. 454), for example, it certainly was not suggested by the court that the vacuum could not enter into the claim as an element. On the contrary, in discussing the claim, the court laid much stress on the importance of the vacuum.

In Electrical Accumulator Co. vs. Julian Electric Co., et al., 38 Fed. Rep. 117, the court in paraphrasing the claim to clearly bring out the elements, named as the 6th element, "any suitable electrolytic liquid." It apparently was looked on in this case as a matter of course that a liquid which performed a function in the operation of the battery was a structural element, and applicant has failed to find a case where this view has been questioned, or where the contrary view has been even considered or urged in opposition to the validity of the patent or invention under consideration.

In addition to the foregoing remarks, it is submitted, that one of the chief difficulties encountered in attempting to provide for the commercial use of acetylene gas has been in finding some safe and economical way of distributing the gas for consumption.

The present applicants have devoted much time to experiments and tests with this in view, and before the present application
525 was filed had made experiments which clearly demonstrated that the invention is a practicable one, having the advantages which are set forth in the specification.

It appears to be beyond question that the invention is a valuable one, and it is difficult to see why the claims should be rejected in the absence of any reference which shows the complete article.

A reconsideration of the application is respectfully requested.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude & Hess.

Sept. 15, 1897.

Indorsed: United States Patent Office, Sept. 17, 1897. U. S. Patent Office, Sep. 18, 1897. Division 31. Serial No. 625,580, Paper No. 4. Amendment B. Filed Sept. 17, 1897. Cls. 1, 3.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Oct. 22, 1897.
Mailed " " "

Georges Marie August Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distillation of Acetylene Gas. Filed March 1, 1897.

BENJ. BUTTERWORTH,
[E. B. MOORE.]*
Commissioner of Patents.

The above case has been reconsidered in view of amendment of Sep. 17, 1897.

Claim 1 is not relieved of the objection raised in the prior letter. The solution of acetylene is not a structural element. This claim and claims 2 and 3 should be drawn to the vessel constructed to contain a solution of acetylene under pressure etc.

526 It is not seen that the claims avoid the patents of record which show a closed vessel capable of holding acetylene under

[* Words and figures enclosed in brackets erased in copy.]

pressure, means for permitting the same to escape and relieving or lowering the pressure.

The claims are rejected.

ELY, *Ex.*

STOKES.

Indorsed: Serial No. 625,580, Paper No. 5. Rejec. Dated Oct. 22, 1897.

Room No. 39.

Application of Georges M. A. Claude and Georges A. Hess for Letters Patent. Serial No. 625,580. Filed March 1, 1897. Apparatus for the Storage and Distillation of Acetylene Gas.

Hon. Commissioner of Patents.

SIR: In the above entitled application the Examiner is respectfully requested to set forth the grounds upon which is based his statement that the solution of acetylene is not a strucural element. As warranting this request, see ex parte Barnes 80 O. G. 2038, relating to a petition on behalf of Barnes that the Examiner should state his grounds for refusing a claim, which petition was granted to — by the Hon. Assistant Commissioner.

It is difficult to conceive of any reason why the vital part of an article or apparatus, without which part the *said* article would be useless for the purpose for which it is intended, should not be regarded as a structural element of the said article.

As has already been stated, the vacuum globe of the incandescent lamp was clearly regarded by the Court as a structural element, and other instances have also been given to show that an element to be "structural" need not be purely mechanical in its nature.

If the ground taken by the Examiner is correct, it is not seen how the mercury in a mercurial thermometer can be regarded as a structural element thereof; and yet the bulb and stem which are adapted to contain the mercury can perform no useful function as a thermometer if the mercury is absent, the mercury thus constituting the element necessary to complete the structure.

In the same manner, applicants' article without the liquid would be incomplete and inoperative, the liquid being a necessary and permanent element of the apparatus, as is the mercury in the thermometer, without which the structure is incomplete and cannot embody the invention.

It would be manifestly improper therefore not to include the liquid as an element of the article claimed, and a claim
527 drawn to cover merely the receptacle as suggested by the Examiner, would fail to properly define the invention.

It is submitted therefore that the claims presented are properly drawn at least as far as this point is concerned, and that they cannot be construed to cover merely the vessel, and should not be so construed for the purposes of anticipation.

For the foregoing reasons the request above made is coupled with a

request for consideration of the grounds above given which it is thought afford a warrant for favorable action on the claims as they now stand.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude and Hess.

November 1, 1897.

Indorsed: U. S. Patent Office. Nov. 3, 1897, Division 31. United States Patent Office, Nov. 2, 1897. Serial No. 625,580, Paper No. 6. Letter. Filed Nov. 2, 1897. Claude & Hess.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Dec. 16, 1897.
Mailed " " "

Georges Maire August Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897.

BENJ. BUTTERWORTH,
[E. B. MOORE.]*
Commissioner of Patents.

In reply to applicants' request that the Examiner state the grounds upon which he bases his statement that the acetylene itself should not be included in the claims he is advised that the inclusion of such element is on a par with the inclusion in a claim for a machine of the material acted upon. As to the incorrectness of such practice see Commissioner's Decision in ex parte Franklin C. D. 73 page 528 116 and the opinion of the supreme court in Morgan Envelope Co. vs. Albany Perforated Paper Co., 67 O. G. 271. The liquid itself might possibly be fairly enough included in a claim, like the mercury in a thermometer as mentioned by applicant, but not the acetylene, which is evanescent.

It may be stated that the examiner holds that sometimes it is proper to claim a substance and package containing it, as when there is some special co-operation between the particular material packed and

[* Words and figures enclosed in brackets erased in copy.]

the peculiar structure of the package, and the package is not sold separately or meant to be refilled after being exhausted.

Any flask containing hydrochloric acid or aqua ammonia or formalin or any other liquid which gas is dissolved and from which the gas is to be or may be evolved is a pertinent reference. Attention is called to the fact that it is an old way of obtaining ammonia gas to evolve it from water containing it in solution. The claims are also rejected as aggregations.

ELY, *Ex.*

Indorsed: Serial No. 625,580, Paper No. [9]* 7. Rejection. Dated Dec. 16, 1897.

Room No. 39.

Application of Georges Marie August Claude and Georges Albert Hess for Letters Patent. Serial No. 625,580. Filed March 1, 1897.

Hon. Commissioner of Patents.

SIR: Please enter an amendment in the above entitled application in accordance with the following instructions:

√Cancel claim 2 and substitute therefor the following:

Subst. D.

[C.]* 2. A closed vessel and a liquid solvent of acteylene contained therein, and partially filling the same, an inlet duct for the introduction of acetylene gas under pressure, said duct having its discharge opening in the lower portion of the liquid solvent, said closed vessel having an outlet opening from the space above the liquid solvent, substantially as and for the purpose described.

[Matter enclosed between rules erased in copy.]

Claim 1 as now expressed covers a complete article, portions of which may or may not be utilized again after the article has served its purpose; that is, it is in the nature of a substance and package containing it, where there is special co-operation between the contained material and the structure of the thing in which it is con-
529 tained. As an illustration, might be given a candle, or a metallic cartridge for a gun. With the latter the case or shell may be preserved and reloaded, but it is more commonly thrown away.

As to claim 2 it refers to the specific construction of a vessel containing a liquid and means for introducing the charging gas into the

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[* Words and figures enclosed in brackets erased in copy.]

body of the liquid from below, and drawing off the gas from the unoccupied space above the liquid.

As none of the references cited show gas holders containing a liquid solvent they of course do not have the specified arrangement of gas inlet and outlets with relation thereto.

For the foregoing reasons reconsideration is requested.

Respectfully submitted,

JOS. P. LIVERMORE,
Att'y for Claude & Hess.

April 3, 1899.

Indorsed: United States Patent Office, Apr. 5, 1899. U. S. Patent Office, Apr. 7, 1899, Division 31. Claude & Hess. Serial No. 625,580, Paper No. 8. Amend't C. Filed April 5, 1899. [Cl. 2]*

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
WASHINGTON, D. C., April 15, 1899.

Georges Marie August Claude and Georges Albert Hess, care of Jos. P. Livermore, Boston, Mass.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897.

C. H. DUELL.
[E. B. MOORE.]*

This application has been considered in reply to the amendment of April 5. The rejection of claims 1 and 3 on the grounds already stated is repeated. The new claim 2 is exactly met by the well known Woulff's bottle on which it is rejected.

ELY, *Ex.*

Endorsed: Serial No. 625,580, Paper No. 9. Rejec. Dated April 15, 1899.

[* Words and figures enclosed in brackets erased in copy.]

530 Serial No. 625,580, Paper No. 10.

Appeal.

Name, Claude & Hess.
Filed March 1st, 1897.
Title, ——.

To Examiners-in-Chief.

Renewal of Appeal, Nov. 23, 1899.
Reasons for appeal, May 9, 1899.
Examiner's statement, May 12, 1899. Feb. 20, 1900.
Notice of hearing, June 7, 1899.
Brief, June 12, 1899.
Decision, June 19, 1899.
Exam'r, Affirmed.
2d Appeal—Ex'r aff'd as to cls. 4, 5, & 6, reversed as to cl. 3—April 12, 1900.
Notice of decision, June 19, 1899.

To Commissioner.

Received, ...
Brief, ...
Notice of hearing, ...
Decision, ...
Notice of decision, ...

Associate Power of Attorney.

Inventors, Georges Marie Auguste Claude and Georges Albert Hess.
Title, Apparatus for the Storing and Distribution of Acetylene Gas.
Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: Please recognize Dodge & Sons (a firm consisting of W. C. Dodge, W. W. Dodge, and H. A. Dodge), of 700 Ninth Street, Washington, D. C., as my associates in the prosecution of the above-entitled application.

Respectfully, JOS. P. LIVERMORE,
Attorney.

[U. S. Revenue Stamp, 25 Cents. D. & S., 6/28/99.]

531 Indorsed: U. S. Patent Office, Jun- 28, 1899. Division 31. Claude & Hess. Serial No. 625,580, Paper No. 11. Asso. Power of Att'y. Filed June 28, 1899.

United States Patent Office.

Room No. 39.

Georges M. A. Claude and Georges A. Hess. Apparatus for the Storing and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: We hereby amend by canceling claims 1, √2 and 3 involved in the recent appeal, and substituting the following:

Subst. E.

[D.]* "1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape there-through at substantially uniform pressure, substantially as described.

Sub. E. 2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure, the package being provided at a point above the solvent with a reducing valve, substantially as and for the purpose set forth.

3. The herein described apparatus for storing gas and delivering it at a substantially uniform rate, the same comprising a shell or vessel *a*, a valved inlet pipe a^2 extending to a point near the bottom of the chamber *a;* a horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with passage d^2 a reducing valve *d* applied to said opening; and a valved outlet pipe *c* through which the gas after passing the reducing valve may escape to the main or distributing pipes.

[D.]* [7, 4].* In an apparatus for storing and delivering gas, a vessel adapted to hold a solvent of the gas; an inlet pipe opening into said vessel near the bottom of the chamber provided for the solvent; an outlet opening from the solvent chamber above the level of the solvent; and a reducing valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity.

Sub. E. 532 [8, 5].* As a new article of manufacture, a gas package comprising a holder

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[* Words and figures enclosed in brackets erased in copy.]

or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, substantially as set forth.

[9, 6].* The herein described holder for gas, comprising a tight vessel having a chamber to receive a solvent of the gas, an outlet for the gas in the upper part of said chamber, a reducing valve applied to said outlet, means for temporarily sealing the vessel completely; and a body of solvent contained within the vessel and adapted to receive a charge of gas."

[Matter enclosed between rules erased in copy.]

Respectfully,

GEORGES M. A. CLAUDE,
GEORGES A. HESS,
By DODGE & SONS,
Associate Att'ys.

Sept. 13th, 1899.

Indorsed: U. S. Patent Office, Sep. 18, 1899, Division 31. Claude & Hess. Serial No. 625,580, Paper No. 12. Amend't D. Filed Sept. 18, 1899. Cls.

United States Patent Office.

Room No. 39.

Georges M. A. Claude and Georges A. Hess. Apparatus for the Storing and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: The amendment herewith presented is drawn in the light of the decision of the Board of Examiners-in-Chief on the recent appeal. The first claim is the claim proposed by the Board, and the remaining claims are believed by us to fall fairly within the distinction or feature of invention recognized by that decision. At all events the decision having been based largely upon matters not previously brought to the attention of applicants, and they desiring to fully contest their right to the claims now made, these several claims are introduced with a view to a further appeal to the Board and these to the Commissioner, should such become necessary.

Respectfully,
DODGE & SONS,
Associate Att'ys.

Sept. 13th, 1899, Washington, D. C.

[* Words and figures enclosed in brackets erased in copy.]

533 Indorsed: U. S. Patent Office, Sep. 18, 1899, Division 31. Claude & Hess. Serial No. 625,580, Paper No. 12. Amend't D. Filed Sept. 18, 1899. [Cls.]*

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., September 28, 1899.
Mailed "

Georges Marie August Claude and George Albert Hess, c/o Dodge and Sons, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Filed March 1, 1897, "Apparatus for the Storage of Acetylene Gas."

C. H. DUELL,
[E. B. MOORE.]*
Commissioner of Patents.

This application as amended September 18, 1899, has been taken up for action. It is found that the amended claims are not all in accordance with the recommendation of the Examiner'-in-Chief and therefore under Rule 142 the primary Examiner is without jurisdiction to consider such claims.

The amendment cannot of course be considered piece-meal. The Board recommended one single claim—applicant has presented six; only one of which is in harmony with the decision of the Board. The second claim is broader in terms that the one recommended—and the others are much broader, for none of them except the 5th contain a supersaturated solution of acetylene". It is not understood that the Board intended to recommend the allowance of any claim which covers the empty receptacle. It was only the receptacle filled with the solvent of acteylene and having acetylene dissolved under pressure in such solvent which the Examiner'-in-Chief found patentable.

Of course there would be no objection to allowing along with the claim recommended by the Appeal Board others which contain all that was in the allowed claim and other matter in addition.

534 The Examiner must however, decline to consider the amendment as being properly in the case under the Rules.

ELY, *Examiner.*

Indorsed: Serial No. 625,580, Paper No. 13. Letter. Dated Sep. 28, 1899.

[Words and figures enclosed in brackets erased in copy.]

United States Patent Office.

G. M. A. Claude & G. A. Hess. Apparatus for the Storing and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: Replying to official communication, we beg to say that while it is true six claims are presented instead of the specific claim outlined in the decision of the Board, we believe that they are within the spirit of said decision. It will be noted that while indicating a claim which, in the opinion of the Board, would be allowable, it recommended the allowance of said claim *or one equivalent in scope*. This we understand to mean that the wording might be varied, so long as the general meaning or scope was that of the claim suggested.

Claim 2, while it does not use the expression "supersaturated" clearly means the same. Every solvent will take up a number of times its own volume of the gas of which it is a solvent, without any pressure being applied. When it has taken up as many volumes as it will contain without pressure, then it is saturated. Whenever pressure is applied, and a larger number of volumes is taken up, it is supersaturated, whether still further volumes could be forced into or caused to be taken up by the solvent or not. This is evidenced by the fact that if the pressure be removed or the vessel be opened to the atmosphere, all gas in excess of the number of volumes absorbed without pressure, will separate out of the solvent, leaving still a saturated solution.

The claims for the apparatus have been redrawn and materially restricted as compared with the claims previously based thereon, and considered on the former appeal. Without at all wishing to secure from Examiner anything which, in his opinion would be contrary to the spirit and intent of the decision of the Board, we respectfully suggest that the Board would not regard as improper, or as contrary to its decision, the independent consideration of these claims and their allowance, if, in the opinion of the Examiner, a clear distinction has been drawn. If Examiner shall be of the opin-
535 ion that the claims are [*allowance*] per se, but is hesitant to allow them because in his judgment to do so would be to run counter to the decision of the Board, we would be glad to have this view indicated in his next action. It is our purpose to press the case in every legitimate way, believing, as we do, that the very important and immensely valuable invention involved in it, is entitled to and should receive protection, but we desire at every stage to get as favorable treatment as the particular official or tribunal then acting on the case may consistently give us.

We earnestly ask careful reconsideration of the case.

Respectfully, DODGE & SONS,
Associate Att'ys.

Washington, D. C., October 24th, 1899.

Indorsed: U. S. Patent Office, Oct. 27, 1899, Division 31. Claude & Hess. Serial No. 625,580, Paper No. 14. Letter. Filed Oct. 27, 1899.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., November 4, 1899.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Dodge and Sons, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distillation of Acetylene Gas. Filed March 1, 1897.

C. H. DUELL,
[E. B. MOORE.]*
Commissioner of Patents.

The examiner, in response to the letter of Oct. 27, in this case, again replies that he holds that he is without jurisdiction to consider the amendment of Sep. 18, 1899, for reasons set forth in the last Office letter.

ELY, *Ex.*

536 Indorsed: Serial No. 625,580, Paper No. 15. Letter. Dated Nov. 4, 1899.

Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Nov. 24, 1899.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Dodge and Sons, Washington, D. C.:

Please find below a communication from the Examiner in charge

[Words and figures enclosed in brackets erased in copy.]

of your application, No. 625,580, Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897.

C. H. DUELL,
Commissioner of Patents.

Applicant has filed an appeal in this case—but the Examiner must refuse to forward the appeal inasmuch as the case is not in condition for appeal.

That statement in the said appeal that on Nov. 4, 1899 the examiner a second time rejected claims 2, 3, 4, 5 and 6 is erroneous. The examiner has not rejected these claims at all; he has in fact twice refused to consider them under the provisions of Rule 142.

Petition lies to the Commissioner from the action of Nov. 4, 1899, rather than appeal to the Examiner-in-Chief.

ELY, *Ex.*

DEPARTMENT OF THE INTERIOR,
U. S. PATENT OFFICE,
WASHINGTON, D. C., Dec. 14, 1899.

Petition: Application of Claude & Hess. Serial No. 625,580. Invention: Apps. for the Storage and Distribution of Acetylene Gas.

537 Referred to the Examiner in charge of Division 31, who is directed to file an answer on the 19 day of Dec., which answer shall exhibit the reasons, if any, why the request of the petition hereto should not be granted.

C. H. DUELL,
[F. I. ALLEN.]*
Commissioner of Patents.

Petition.

United States Patent Office.

G. M. A. Claude and G. A. Hess. Apparatus for Storage and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: The petition of the above-named applicants respectfully represents:

That on the 1st day of March, 1897, they filed application for letters patent for Apparatus for Storing and Distributing Acetylene Gas, together with a companion application covering the Method of Storage and Distribution; that said applications were, after repeated consideration, finally rejected upon certain citations; that in due course appeals were taken to the Board of Examiners-in-Chief that upon considering said appeals the Board reversed the Examiner in

[Words and figures enclosed in brackets erased in copy.]

the Method case, and affirmed him as to the Apparatus case, but suggested and recommended in the latter case a certain claim as allowable. The decision in the Apparatus case included as follows:

"We are unwilling to allow these claims as drawn, and the decision of the Examiner is accordingly affirmed subject to the recommendation on or the allowance of the claim recommended or one equivalent in scope."

Pursuant to this recommendation, said claim was introduced into the case by amendment, together with others believed to be within the spirit and intent of the recommendation.

It is proper to say that at the hearing of the appeals, the Board brought forward certain publications not cited by the Examiner, and upon which its decisions in both cases were largely based.

In view of these matters, material amendment of both cases became necessary, and applicants were of course entitled to full
538 opportunity to discuss these new references and to amend their cases in the light thereof, hence they were clearly entitled to introduce not merely the claim specifically suggested by the Board, but other claims of like tenor, or in fact such claims as the new citations to render proper or desirable.

Examiner declines to entertain any of the claims now presented save the specific one proposed by the Board, and instead of answering a renewal appeal sought to be taken to the Board in this case, states that "petition lies to the Commissioner from the action of Nov. 4th, 1899 rather than an appeal to the Examiners-in-Chief.

Your petitioners respectfully ask that in view of the circumstances of this case, and to the end that applicants may have full and fair opportunity to prosecute their case as contemplated by the statute and the rules in such cases made and provided, the Examiner be directed to enter the amendment last filed and include the claims above referred to, and treat the same as though originally presented in the case unless he shall hold, as has not been suggested, that they are outside of the original disclosure of the application.

Respectfully,

G. M. A. CLAUDE,
G. A. HESS,
By DODGE & SONS,
Associate Att'ys.

Washington, D. C., Dec. 13, 1899.

Indorsed: U. S. Patent Office, Dec. 14, 1899. Intf. No. 625,580, Paper No. 17. Paper No. —. Petition. Filed Dec. 14, 1899. Claude & Hess.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
B. W. M. WASHINGTON, D. C., Dec. 14th, 1899.

In the Matter of the Application of Claude & Hess. Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897. Ser. No. 625,580.

Petition.

SIR: You are hereby informed that the hearing on the above petition from the action of the Primary Examiner has been fixed for Wednesday, December 27, 1899, at 10:30 A. M.

539 By direction of the Commissioner.

Very respectfully, E. V. SHEPARD,
Chief Clerk.

J. M. F.

Claude & Hess, c/o Dodge & Sons, Washington, D. C.

Indorsed: Serial No. 625,580, Paper No. 18. Notice of Hearing. Dated Dec. 14, 1899. Claude & Hess.

U. S. Patent Office,
Dec. 19, 1899,
Mailed.

Application of G. M. A. Claude and G. A. Gess. Apparatus for the Storage and Distribution of Acetylene Gas. Ser. No. 625,580. Filed March 1, 1897.

Petition to the Commissioner.

Examiner's Statement.

This application was appealed to the Examiner in Chief on May 9, 1899 and the decision of the primary examiner was affirmed.

The Examiners-in-Chief however, recommended the allowance of the following claim:

"A closed vessel containing a supersaturated solution of Acetylene produced by forcing acetylene into the solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced and means for controlling said outlet whereby the gas escapes there through at substantially uniform pressure substantially as described."

The applicants on Sep. 18, 1899 presented an amendment containing the following claims:

1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, and means for con-

trolling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described.

540 2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure, the package being provided at a point above the solvent with a reducing valve, substantially as and for the purpose set forth.

3. The herein described apparatus for storing gas and delivering it at a substantially uniform rate, the same comprising a shell or vessel *a*, a valved inlet pipe a^2 extending to a point near the bottom of the chamber *a*; a horozontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2; a reducing valve *d* applied to said opening; and a valved outlet pipe c through which the gas after passing the reducing valve may escape to the main or distributing pipes.

4. In an apparatus for storing and delivering gas, a vessel adapted to hold a solvent of the gas; and inlet pipe opening into said vessel near the bottom of the chamber provided for the solvent; an outlet opening from the solvent chamber above the level of the solvent; and a reducing valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity.

5. As a new article of manufacture, a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent substantially as set forth.

6. The herein described holder for gas, comprising a tight vessel having a chamber to receive a solvent of the gas, an outlet for the gas in the upper part of said chamber, a reducing valve applied to said outlet, means for temporary sealing the vessel completely; and a body of solvent contained within the vessel and adapted to receive a charge of gas."

Whereupon the Examiner on Sept. 28, 1899, wrote as follows:

"This application as amended Sep. 18, 1899, has been taken up for action. It is found that the amended claims are not all in accordance with the recommendation of the Examiners-in-Chief and therefore under Rule 142 the Primary Examiner is without jurisdiction to consider such claims.

The amendment cannot of course be considered piece-meal. The Board recommended one single claim—applicant has presented six; only one of which is in harmony with the decision of the Board.

The second claim is broader in terms than the one recom-
541 mended—and the others are much broader, for none of them except the 5th, contain "a supersaturated solution of acetylene". It is not understood that the Board intended to recommend the allowance of any claim which covers the empty receptacle. It was only the receptacle filled with the solvent of acetylene and having acetylene dissolved under pressure in such solvent which the Examiner-in-Chief found patentable.

Of course there would be no objection to allowing along with the

claim recommended by the Appeal Board others which contain all that was in the allowed claim and other matter in addition. The Examiner, must however, decline to consider the amendment as being properly in the case under the Rules."

In response to this the applicant wrote that

"While it is true six claims are presented instead of the "specific claim outlined in the decision of the Board, we believe that they are within the spirit of said decision."

It is not seen how the applicant or their attorney can say that the claims presented are within the spirit of the decision.

The second of the proposed claims contains a solvent of acetylene with acetylene dissolved therein but there is nothing in the claim about its being supersaturated with acetylene. As far as the claim is concerned it covers the case where the solvent is less than saturated with acetylene.

Claims 3 and 4 do not include any solvent. They cover merely the empty vessel. As the examiner stated, it does not appear that the Board intended to recommend the allowance of any claim which would cover the empty receptacle.

Claim 6 includes the solvent but there is no acetylene in it. That is to say it covers a bottle more or less filled with alcohol, water, petroleum or any of the solvents of acetylene.

The fifth claim is probably within the spirit of the recommendations of the Examiners-in-Chief.

On Nov. 23, 1899, applicant renewed his appeal to the Examiner-in-Chief. Naturally the Examiner could not forward such appeal; he had declined to consider the claims of Sep. 18, 1899 on the ground of want of jurisdiction and had repeated his statement that he was without jurisdiction.

The Examiner therefore had no option when the appeal was renewed but to decline to forward it to the Examiners-in-Chief as he did in his letter of Nov. 24, 1899.

Now come the Petitioners and request that the Examiner "be directed to enter the amendment last filed and include the claims above referred to and treat the same as though originally presented in the case."

This petition, which should have been filed when the amendment was presented, should it is held, be denied.

542 The applicant has had his day in court and the Examiners-in-Chief have, as it seems to the examiner, been sufficiently liberal in their suggestion as to the allowance of a claim. In the petition it is urged that the applicants are

"clearly entitled to introduce not merely the claim specifically suggested by the Board, but other claims of 'like tenor, or in fact such claims as the new citations' seemed to render proper or desirable."

There were no new citations by the Examiners-in-Chief in this case even were there such, then last of the above statement of the petitions as to their rights is doubtful. There is nothing in the rules or the law giving them a right to introduce "such claims as the new citations seemed to render proper or desirable."

In regard to the first part of the above statement of the petitions

as to their rights, it may be said that it is not entirely clear that they have any such right.

The Board recommended the allowance *of* a certain claim or *one* equivalent in scope. The petitioners have presented six claims. A supersaturated solution of acetylene was the prominent feature of the claim recommended by the Board; that feature is entirely absent as has been stated in four of the six claims presented by the petitioners.

The entrance of the proposed amendment will reopen the entire case; it would necessitate an entirely new examination in fields not searched in the prior history of the case. The examiner does not believe any of the claims presented are patentable except the first, (suggested by the Board) and the fifth which is limited to acetone. Whereas on the contrary if the petitioners had presented the sole claim recommended by the Board, or that along with others still more limited, the case could have been sent to issue at once.

The question of jurisdiction has been the sole question in the case since the presentation of the amendment of Sep. 18.

Now however, that the petitioners have requested that the examiner be directed to enter and consider the said amendment, the examiner in looking more closely into the substance of such claims finds some of them to be wholly outside the scope of the recommendation of the Board. The very gist of the claim recommended by the Board i. e. a supersaturated solution of acetylene, is lacking in four of the six proposed claims. It is clear that a supersaturated solution of acetylene contained in a proper vessel with an appropriate reducing valve, is a distinct and separate invention from that of a mere empty packing or storing vessel equally adapted to con-
543 tain a solution of acetylene, or one of ammonia, or even seltzer water.

This leads the examiner to urge another reason against the admission of the proposed amendment as a whole (and it can not be admitted piecemeal) which has not before occurred to him.

The third and fourth of the proposed claims are directed solely to the storage vessel and as such would be examinable in another division of the office; that is to say the amendment presented is one which if entered *would* result in a requirement for division: some of the claims belonging to Div. 31 and others to Div. 32. On this it was decided in ex parte Regan, (45 O. G. 589):

"if the new matter presented in an amendment contains claims for another and distinct invention, which if admitted would immediately require a division of the application to be made or applicant to elect which invention he will prosecute in the pending application, it should not be admitted."

It is for these reasons urged that the petition be denied and the petitioners be informed that they should present an amendment clearly in line with the recommendations of the Board, in each claim of which a supersaturated solution of acetylene should figure as an element.

Respectfully, G. S. ELY, *Examiner.*

Div. 31, Dec. 19, 1898.

Indorsed: Claude & Hess. Serial No. 625,580, Paper No. 19. Examiner's Statement. Dated Dec. 19, 1899.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
B. W. M. WASHINGTON, D. C., Dec. 26th, 1899.

In the Matter of the Application of Claude & Hess. Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897. Ser. No. 625,580.

Petition.

SIR: You are hereby informed that the hearing on the above petition has been continued to Wednesday, January 3, 1900, at 10:30 A. M.

544 By direction of the Commissioner,
Very respectfully, E. V. SHEPARD,
Chief Clerk.

J. M. F.

Claude & Hess, c/o Dodge & Sons, Washington, D. C.

Endorsed: Serial No. 625,580, Paper No. 19½. Notice of Postponement. Dated Dec. 26, 1899. Claude & Hess.

United States Patent Office.

Application of G. M. A. Claude and G. A. Hess. Apparatus for the Storing and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 652,580.

Petition to the Commissioner.

The petition in this case asks that the Examiner be directed to enter the amendment last filed and include the claims therein contained, and that he treat the same as though originally presented in the case, unless he shall hold, as has not been suggested, that they are outside of the original disclosure of the application.

The petition pertained only to claims 3, 4, 5, and 6 of the amendment, claim 1 being recognized by the Examiner as in accordance with the recommendation of the Board, and consequently allowable.

With regard to claim 5, the Examiner in his answer to the petition says:

"The fifth claim is probably within the spirit of the recommendation of the Examiners-in-Chief."

In view of these facts, claims 1 and 5 of said amendment seem unnecessary to be discussed herein, but are to be taken as allowable in the opinion of the examiner. We shall therefore refer only to claims 3, 4 and 6 of the amendment.

A brief statement of the history of this application is essential to a clear understanding of the present situation and petition.

Two applications were filed in the joint names of these petitioners on the 1st day of March, 1897—one for Apparatus for Storing and Distributing Acetylene Gas, and the other for Method or Process thereof. Briefly stated, the apparatus consists of a strong vessel having a horizontal diaphragm provided with an opening controlled by an automatic pressure regulating valve,—that is to say, by a
545 valve which opens less or more according as the pressure is greater or less, and thus maintains a practically constant outflow of gas at a pressure but slightly above that of the atmosphere. The vessel is further provided with a cock closing the upper chamber into which the gas enters through the automatic valve, so that delivery of gas may be wholly cut off if desired, and it is furnished with a charging tube extending to near the bottom of the lower chamber of the vessel and provided with suitable cocks.

The mode of storing and distributing the gas is based upon the well known scientific fact that various liquids have the capacity of dissolving gases and of taking up many times their own volume of such gases. At atmospheric pressure these solvents will take up a number of times their own volume of such gases, and by increasing the pressure the number of volumes which they will dissolve and hold is proportionately increased. By reason of this peculiarity an enormous volume of gas can be dissolved and stored in a suitable solvent in relatively small space, and at comparatively low pressure.

If the solvent contains only so much gas as it will dissolve at atmospheric pressure, or in the absence of special and artificial pressure, it becomes a saturated solution. If pressure is applied, it becomes of course a supersaturated solution, because it contains more than will remain in a state of solution if the pressure be removed, although many times the volume of the solvent will so remain dissolved when the pressure *is* removed. Hence, when the expression "acetylene dissolved in and held by said solvent under pressure" is employed, it necessarily implies and clearly means a supersaturated solution.

The two applications were rejected by the Primary Examiner upon various citations, none of which, however, disclosed the fact that with increase of pressure, a greater number of volumes of gas could be dissolved in a given solvent than without such pressure. The cases were duly appealed to the Board of Examiners-in-Chief, who, at the hearing of the case, of their own knowledge, and of their own volition, brought forward certain publications showing this fact to be one recognized in text books on such subjects. Accordingly, while reversing the Examiners as to the method case, they directed the attention of the Commissioner to these publications as showing a lack of novelty in the claims of the method case. In the other, or apparatus case, which is the one involved in this petition, they affirmed the Examiner, but recommended the allowance of a claim such as recited in the answer of the Examiner and incorporated as claim 1 in the amendment under consideration. The decision of the
546 Board, however, in each case, referred to the decision in the companion case, and the two cases were thus tried together, and practically treated as one in their consideration by the Board. In this way the present, or apparatus case was no less affected by mat-

ters of which applicants had no previous notice, and which should have been cited to them to guide them in the amendment and treatment of their case than was the method application. We submit, therefore, that the privilege of the applicants, when the case went back to the Examiner, to amend their case in any particular suggested or called for by the new matters brought to their attention through the decision of the Board, and which in any manner went to determine the finding of the Board or its treatment of the case, should have been recognized.

It seems plain, therefore, that these several claims should be allowed *to* stand in the case, to the end that upon again going before the Board, as applicants have sought to do, they may have their case considered on such claims as, in the light of the art developed by the action of the Office, they are entitled to make.

Apart from this, however, it is submitted that for the reasons above pointed out, claim 2, though not using the term "supersaturated solution", is nevertheless restricted to such solution, since it does specify "acetylene dissolved in and held by said solvent under pressure."

Examiner is clearly wrong therefore in his statement on page 3 of his answer concerning the second claim. As evidencing our good faith in this contention, we are entirely willing that the claim be amended to specify a supersaturated solution, in terms.

The objection to claims 3 and 4, as now stated by Examiner in his answer to the petition, appears to be that they do not include the solvent or the gas. Here again we have no objection whatever to including these matters. This done, we are *satisfied* the claims will be recognized by the Examiner, as clearly within the recommendation of the Board, since they include all the elements mentiond by the Board, some of them, however, more fully and specifically described and limited as to details of construction than in the claim recommended by the Board.

Claim 6 does not, it is true, recite the gas dissolved in the solvent, but it recites all the elements of the apparatus necessary to enable the gas to be dissolved and bound in the vessel, and this we think *in* sufficient. At all events we desire and are entitled to take the judgment of the Board thereon.

With regard to the suggested division of the application, we have to say that our impression is that foreign patents already
547 taken would preclude such division, or raise a question as to the validity of any patent issuing upon such division. We are not at this moment prepared to make this statement definitely, but suggest that in any event the question of division may safely be left for future consideration.

We respectfully ask that in view of the foregoing facts, the petition be granted, and we suggest that in view of the matters above pointed out, the Examiner should be instructed to consider the claims and make the objections thereto recited in his answer, giving to applicants proper opportunity to bring them into consonance with Examiner's ideas as understood from his statement in answer to this petition. It is believed that such a course will rendered unnecessary

any appeal as to any of the claims of the amendment save perhaps the 6th.

Respectfully,

DODGE & SONS,
Associate Att'ys.

Washington, D. C., January 3, 1900.

Endorsed: Serial No. 625,580, Paper No. 20. Brief for Petitioners. Filed Jan'y 3rd, 1900. Claude and Hess. U. S. Patent Office, Jan. 3, 1900.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
B. W. M. WASHINGTON, D. C., Jan. 17, 1900.

In the Matter of the Application of Claude & Hess. Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897. Ser. No. 625,580.

Petition.

SIR: You are hereby informed that the above petition has been granted by the Assistant Commissioner to the extend indicated in his decision of even date herewith. A copy of which is enclosed herewith.

By direction of the Commissioner.

Very respectfully,

E. V. SHEPARD,
Chief Clerk.

J. M. F.

548 Claude & Hess, c/o Dodge & Sons, Washington, D. C.

Endorsed: Serial No. 625,580, Paper No. 21. Notice of Comm'r's Decision. Dated Jan'y 17, 1900. Claude & Hess.

United States Patent Office.

Ex Parte G. M. A. CLAUDE and G. A. HESS.

Apparatus for the Storage and Distribution of Acetylene Gas.

Petition.

Application filed March 1, 1897, No. 625,580.

Mr. Jos. P. Livermore and Messrs. Dodge and Sons for applicants.

This is a petition from the action of the primary examiner refusing to enter and consider an amendment filed in the above entitled case on September 18, 1899.

The record shows that claims in this case were finally rejected by the examiner and an appeal was taken from his decision to the examiners-in-chief. On that appeal the examiner's decision was

affirmed, but a certain claim was suggested under Rule 139 as allowable over the references of record. The applications thereupon presented the amendment of September 18, including the suggested claim as claim No. 1, and five other claims which they contend come within the spirit and intent of the recommendation of the examiners-in-chief. The examiner states that he is willing to enter and allow the claim suggested and also more specific claims to the same thing coming within the spirit of the recommendation, such, for instance, as claim 5 presented, but that claims 2, 3, 4 and 6 are broader than anything suggested by the examiners-in-chief as allowable and that therefore they cannot be held to come within the recommendation. He calls attention to the fact that the suggested claim includes a solvent supersaturated with acetylene and states that claim 2 does not set forth that the solvent included is supersaturated. The applicants contend that it does in effect include that limitation, but state that they are willing to amend it by setting it forth positively in order to meet the examiner's views. If this is done, it would seem that the examiner's objection to claim 2 would be removed.

The examiner objects to claims 3 and 4 in that they do not even include the solvent as an element, but cover merely the empty vessel. In regard to these claims also the applicants state in their brief on this petition that they are willing to so amend as to meet the examiner's views and to avoid his objections.

549 In his answer to this petition the examiner has raised the objection to claims 3 and 4 that they relate to a different invention from that covered by the remaining claims and has stated that their entry would immediately necessitate the requirement for division. He states that the matter covered by these claims is examinable in Division 32, whereas the remaining claims *being* in Division 31. This holding was not previously *announced* to the applicants and therefore they had not had a full opportunity to present their views in the matter before the examiner. If it is correct, as it seems to be, the examiner was right in refusing to enter and consider these claims. Ex parte Zabel, 43 O. G. 6257, ex parte Eschner, 63 O. G., 760, ex parte Richter, 85 O. G., 1908. It would seem, however, that the applicants' proposed amendment to these claims to meet the examiner's views would remove this objection, as well as the objection that they do not come within the recommendation of the examiners-in-chief.

Claim 6 includes a solvent "adapted to receive a charge of gas," but does not state positively that it is supersaturated with acetylene. This claim is therefore in that respect somewhat broader than the claim actually suggested by the Examiners-in-Chief and it is not certain whether or not their recommendation was intended to apply to such a claim. It is thought best, therefore, to direct that this claim be entered and considered *on* its merits, so that if the examiner does not regard it as allowable the examiners-in-chief may pass upon the question whether or not it comes within what they regarded as patentable.

Amendments cannot be entered or considered piece-meal, however, and therefore in order to be entitled to consideration the applicants

should file a new amendment containing claims 1 and 6 and the remaining claims amended as suggested.

To the extent indicated the petition is granted.

A. P. GREELEY,
Assistant Commissioner.

January 17, 1900.

Endorsed: Serial No. 625,580, Paper No. 21. Commis- Decision. Dated Jan'y 17, 1900. Claude & Hess. Recorded, Vol. 68, Page 379.

United States Patent Office.

Room No. 39.

G. M. A. Claude and G. A. Hess. Apparatus for Storage and Distribution of Acetylene Gas. Filed March 1, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: We hereby amend as follows:

550 *Cancel claims 1, 2 and 3* involved in the appeal taken to *the Board May 9th, 1899, and substitute as follows:*

E. 1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape there-through, at substantially uniform pressure, substantially as described.

2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a reducing valve, substantially as and for the purpose set forth.

3. The herein described apparatus for storing gas and delivering it at a substantially uniform rate, the same comprising a shell or vessel a containing a supersaturated solution of gas; a valved inlet pipe a^2 extending to a point near the bottom of the chamber a; a horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^2, a reducing valve d applied to said opening; and a valved outlet pipe c through which the gas after passing the reducing valve may escape to the main or distributing pipes.

E. 4. In an apparatus for storing and delivering gas, a vessel containing a supersaturated solution of gas; an inlet pipe opening into said vessel near the bottom of the chamber provided for the solvent; an outlet opening from the solvent

chamber above the level of the solvent; and a reducing valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity.

5. As a new article of manufacture, a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, substantially as set forth.

6. The herein described holder for gas, comprising a tight vessel having a chamber to receive a solvent of the gas, an outlet for the gas in the upper part of said chamber, a
551 reducing valve applied to said outlet, means for temporarily sealing the vessel completely; and a body of solvent contained within the vessel and adapted to receive a charge of gas under pressure and to form therewith a supersaturated solution.

Respectfully,

GEORGES M. A. CLAUDE,
GEORGES A. HESS,
By DODGE & SONS,
Associate Att'ys.

January 18th, 1900.

Endorsed: U. S. Patent Office, Jan. 18, 1900, Division 31.

United States Patent Office.

Room No. 39.

G. M. A. Claude and G. A. Hess. Apparatus for Storage and Distribution of Acetylene Gas. Filed March 1st, 1897. Serial No. 625,580.

Hon. Commissioner of Patents.

SIR: The amendment herewith presented is, we believe, in exact accord with the views expressed by the Hon. Assistant Commissioner in his decision dated January 17th, 1900. Claims 1 to 5 seem therefore in condition for allowance, and only claim 6 is open for discussion. As to this claim, we respectfully submit that while it does not include the gas dissolved and bound in the solvent, it does specifically recite the solvelt adapted to receive a charge of gas under pressure and to form therewith a supersaturated solution. In view of certain decisions of the Courts, at least questioning the propriety of a claim reciting as an element a member which is fugitive or fleeting in character, and which once used ceases to be a part of the combination, we deem it the part of wisdom to make at least one claim which shall recite only those elements which remain and continue in use, however often or to whatever extent the vessel may be charged with gas.

Believing that as now presented, and that in view of the matter just pointed out Examiner will see the justice of our position, we ask reconsideration of the case.

Respectfully,

DODGE & SONS,
Associate Att'ys.

Washington, D. C., January 18, 1900.

Endorsed: Claude & Hess. Serial No. 625,580, Paper No. 22. Amend't E. Filed Jan. 18, 1900. Cls. —. U. S. Patent Office, Jan. 18, 1900. Division 31.

552 Div. —, Room 39.

Address only "The Commissioner of Patents, Washington, D. C."

Paper No. —.

All communications respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., Jan. 23, 1900.
Mailed " " "

Georges Marie Auguste Claude and Georges Albert Hess, care of Dodge and Sons, Washington, D. C.:

Please find below a communication from the Examiner in charge of your application, No. 625,580, Apparatus for the Storage and Distribution of Acetylene Gas. Filed March 1, 1897.

C. H. DUELL,
Commissioner of Patents.

The amendment of Jan. 18, 1900, has been entered in the case in view of the decision of the Commissioner.

In view of the decision of the Examiners-in-Chief claims 1 and 2 may be allowed. The other claims in the case are rejected in view of the decision of the Board and in view of the state of the art as disclosed in the references. The applicants say in presenting the amendment that claims 1 to 5 seem allowable and only claim 6 to be open for discussion. The examiner cannot agree with the applicant as to claims 3, 4 and 5 for the reason that such claims are not limited to acetylene. They cover any gas. The Examiners-in-Chief recommended the allowance of a claim only on the ground that they were impressed with the fact that applicants had devised a novel means of dispensing acetylene.

Claims 3, 4 and 5 as drawn are rejected, but may be allowed on the insertion of the word "acetylene" before "gas".

The examiner had not before noted that claim 5 in the proposed amendment of Sept. 18, 1899 was not limited to acetylene.

Claim 6 which includes no gas of any kind if wholly outside of any claim recommended by the Board.

The appeal in the other case is set down for hearing on Jan. 29. In case applicants desire this case to be heard at the same time further action before the Examiner will be waived if applicant so desire; Though, as stated, it will be un-ecessary to appeal claims 3, 4 and 5 if applicants will make the amendment suggested.

ELY, *Ex.*

553 Endorsed: Serial No. 625,580, Paper No. 23. Rejec. Dated Jan. 23, 1900.

United States Patent Office.

Room No. 39.

G. M. A. Claude and G. A. Hess. Filed March 1st, 1897. Serial No. 625,580. Apparatus for Storing Acetylene Gas.

Hon. Commissioner of Patents.

SIR: We hereby amend as follows:

F. Cancel the first paragraph of page 2, (lines 1 to 7 inclusive) and substitute:

F'. "This invention pertains to apparatus for the storage and distribution of acetylene gas, and is designed to carry out a process of storage and distribution involving the employment of a chamber charged with a solvent of the gas to be stored, and into which the gas is forced under suitable pressure. The apparatus is to be charged or prepared at a central station or distributing point, and shipped or transported to the intended place of use, as a complete article or "package", adapted to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated."

Respectfully,

G. M. A. CLAUDE,
G. A. HESS,
By DODGE & SONS,
Associate Att'ys.

Washington, D. C., June 11th, 1900.

Endorsed: Claude & Hess. Serial No. 625,580, Paper No. 24. Amendment F. Filed June 12, 1900. U. S. Patent Office, Jun- 12. 1900. Division 31.

Issue Division.

Serial No. 625,580.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., June 16, 1900.

George M. A. Claude and George A. Hess, *Assor's*, c/o Dodge & Sons, *Assoc.*, City.

SIR: Your Application for a patent for an Improvement in Apparatus for Storing and Distributing Acetylene Gas filed Mar. 1, 1897, has been examined and Allowed.

554 The final fee, Twenty Dollars, must be paid, and the Letters Patent bear date as of a day not later than Six Months from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised [Stat-es]. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least Twenty Days prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, Distinctly and Plainly Written, the name of the Inventor and Title of Invention as Above Given, Date of Allowance (which is the date of this circular), Date of Filing, and, if assigned, the Names of the Assignees.

If you desire to have the patent issue to Assignees, an assignment containing a Request to that effect, together with the Fee for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of Specifications and drawings will be charged for at the following rates: Single copies, uncertified, 5 cents each. The money should accompany the order.

Very respectfully,

C. H. DUELL,
Commissioner of Patents.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

(On the left outer edge of said sheet appears the following:

The within title is that given by the Examiner in charge as most appropriate to your invention. Should you desire a change in the

No. 864,383. Patented Dec. 25, 1900.

556

G. M. A. CLAUDE & G. A. HESS.

APPARATUS FOR STORING AND DISTRIBUTING ACETYLENE GAS.

(No Model.) (Application filed Mar. 1, 1897.)

FIG. 1.

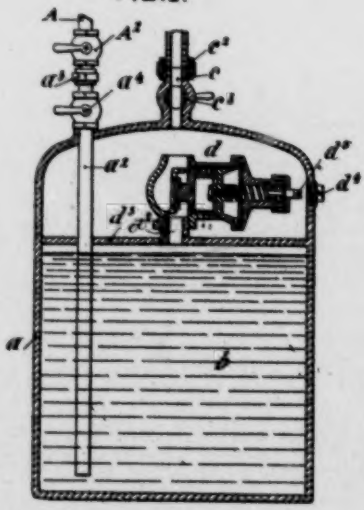
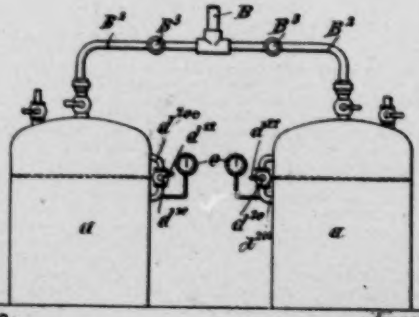


FIG. 2.



Witnesses
Jas. F. Maloney
Mahlon P. Smith

Inventors
Georges M. A. Claude
and Georges A. Hess
by Jno. L. Sinnott
Atty.

UNITED STATES PATENT OFFICE.

GEORGES MARIE AUGUSTE CLAUDE, OF ST. MANDÉ, AND GEORGES ALBERT HESS, OF PARIS, FRANCE, ASSIGNORS TO BRUNO ABDANK-ABAKANOWICZ, OF PARC ST. MAUR, FRANCE.

APPARATUS FOR STORING AND DISTRIBUTING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 664,383, dated December 25, 1900.

Application filed March 1, 1897. Serial No. 625,580. (No model.)

To all whom it may concern:

Be it known that we, GEORGES MARIE AUGUSTE CLAUDE, residing at St. Mandé, and GEORGES ALBERT HESS, residing at Paris, France, citizens of the Republic of France, have invented an Improvement in Apparatus for the Storage and Distribution of Acetylene Gas, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention pertains to apparatus for the storage and distribution of acetylene gas, and is designed to carry out a process of storage and distribution involving the employment of a chamber charged with a solvent of the gas to be stored and into which the gas is forced under suitable pressure. The apparatus is to be charged or prepared at a central station or distributing-point and shipped or transported to the intended place of use as a complete article or "package" adapted to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated.

To this end the apparatus embodying the present invention consists, essentially, in a closed receptacle containing acetylene gas in solution and having an outlet for the gas so positioned as to be normally above the level of said solution and adapted to be provided with a burner or connected with a pipe system for the final use or distribution of the gas which escapes from the solution owing to the diminution of pressure when the said outlet is opened. It is desirable, moreover, that the receptacle which contains the liquid solvent should be conveniently arranged for the charging process as well as for the discharging process, and to that end the said receptacle is shown as consisting of a fluid-tight vessel having an inlet as well as the outlet, the mouth of said inlet being extended below the surface of the solvent liquid, so that gas introduced through the same will pass through the liquid to aid in the solution of said gas. The inlet and outlet passages are provided with suitable valves or cocks to close the same after the receptacle is charged with gas and when it is not in use. It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at substantially uniform pressure, a reducing-valve being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use.

Figure 1 is a vertical cross-section of the apparatus embodying the invention, and Fig. 2 an elevation showing a modification.

The receptacle or closed vessel *a* is provided with an inlet-tube a^3, having a suitable coupling a^2 for connecting the same to the gas-supply pipe A, shown as provided with a controlling-valve A^2, whereby the gas-supply may be turned on after the receptacle *a* is coupled to the pipe A and turned off after the said receptacle is properly charged, the said inlet-tube being also provided with a valve or cock a^4. Contained within the reservoir is a fluid *b*, such as alcohol or acetone, capable of dissolving acetylene gas.

In order to facilitate the process of solution, the tube a^3 is shown as extending downward nearly to the bottom of the receptacle *a*, so that the gas is admitted at a point near the bottom thereof and rises through the liquid as it enters. To discharge the gas from the said receptacle *a*, the upper portion thereof has an outlet-passage *c*, provided with a coupling c^2 for the purpose of connecting it to the pipe system leading to the burners which are to be supplied or to a single burner, and a valve c^3, adapted to be opened after the receptacle is properly coupled for use.

In order that the gas delivered from the receptacle may pass into the pipes to the burners under a substantially uniform pressure, (the pressure of the gas within the receiver of course decreasing as the gas passes out therefrom,) a reducing-valve *d* of any suitable or usual construction is interposed between the interior of the receptacle and the outlet *c* therefrom. As herein shown, the said reducing-valve *d*, in a passage d^3, connecting the spaces below and above a wall or

partition d^3 near the upper portion of the receptacle a, the dissolved acetylene being contained in that portion of the receptacle which is below the said partition, the portion above being normally empty and forming a reservoir for the gas at low pressure which has passed into said reservoir through the said reducing-valve. In order that the reducing-valve d may be set or adjusted to respond to any desired pressure, the vessel a is shown as provided with a removable plug d^5, through which access may be had to the adjusting-stem d^2 of said valve. It is obvious that through the agency of the reducing-valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted.

When the gas-storing apparatus is to be connected with supply-pipes for distribution throughout a building, it is desirable to duplicate the apparatus, as shown in Fig. 2, and by setting the reducing-valve d^{10} of one receptacle to respond to a slightly-lower pressure than that of the reducing-valve d^{20} of the other receptacle the receptacle having its valve set for lower pressure will not begin to deliver gas until the contents of the other receptacle are substantially exhausted, after which the one having its reducing-valve set for lower pressure will begin to deliver its contents. In this instance the reducing-valves may be placed at the exterior of the vessels, the passages from the lower to the upper chambers thereof being formed in the tubes d^{30}, and said valves are shown as provided with adjusting-handles d^{12} and d^{22}, whereby they may be readily set, as above described. The two receptacles are shown as connected with a main pipe B through branch pipes B^2, each of which has a valve or cock B^3 to prevent the escape of gas while either receptacle is being changed. A pressure-gage e may also be supplied for each receptacle to indicate the pressure of the gas contained in solution, and thus to show at a glance when one of the reservoirs is empty and the other is beginning to be drawn upon. At or after this time a charged receptacle may be substituted for the empty one and its reducing-valve set at a slightly-lower pressure than that of the one which is then partially discharged. By this plan it is possible to use up substantially the whole charge of each reservoir without danger of failure of the supply.

It may in some cases be desirable to provide each apparatus with a burner, so that said apparatus in itself constitutes a lamp, or to provide lamp-burners, in conjunction with which the apparatus may be used as a detachable fount.

It is not intended to limit the invention to the specific construction herein shown, since modifications may obviously be made.

We claim—

1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described.

2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a reducing-valve, substantially as and for the purpose set forth.

3. The herein-described apparatus for storing gas and delivering it at a substantially uniform rate, the same comprising a shell or vessel a containing a supersaturated solution of gas; a valved inlet-pipe a^2 extending to a point near the bottom of the chamber a; a horizontal diaphragm d^3 extending across the chamber in its upper portion and provided with a passage d^4; a reducing-valve d applied to said opening; and a valved outlet-pipe e through which the gas after passing the reducing-valve may escape to the main or distributing pipes.

4. In an apparatus for storing and delivering gas, a vessel containing a supersaturated solution of gas; an inlet-pipe opening into said vessel near the bottom of the chamber provided for the solvent; an outlet-opening from the solvent-chamber above the level of the solvent; and a reducing-valve applied to said outlet and serving to permit escape of the gas in regulated and uniform quantity.

5. As a new article of manufacture, a gas-package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing-valve applied to an opening extending to the interior of the holder above the level of the solvent, substantially as set forth.

6. The herein-described holder for gas, comprising a tight vessel having a chamber to receive a solvent of the gas, an outlet for the gas in the upper part of said chamber, a reducing-valve applied to said outlet, means for temporarily sealing the vessel completely; and a body of solvent contained within the vessel and adapted to receive a charge of gas under pressure and to form therewith a supersaturated solution.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGES MARIE AUGUSTE CLAUDE.
GEORGES ALBERT REES.

Witnesses:
EDWARD P. MACLEAN,
MAURICE H. PIGNET.

same, satisfactory reasons Must be given therefor on or before the payment of the final fee. In Remitting the Final Fee Give the Serial Number at the Head of this Notice.

On the right outer edge of said sheet appears the following: If payment is made by check or draft, the credit allowed is subject to the collection of the same.

555 If payment is made by check or draft, the credit allowed is subject to the collection of the same.)

Amount Received, —. Chief Clerk.

2–327.

Memorandum of Fee Paid at United States Patent Office.

(Be careful to give correct Serial No.)

Serial No. 625,580, ——, 18—, —— —.

Inventor:
Georges M. A. Claude and Georges A. Hess.

Patent to be Issued to
See Record.

Name of Invention, as Allowed:
Apparatus for the Storing and Distribution of Acetylene.

Date of Payment:
Dec. 1st, 1900.

Fee:
$20.00

Date of Filing:
March 1st, 1897.

Date of Circular of Allowance:
June 16th, 1900.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

DODGE AND SONS, *Attorneys.*

Send Patent to Dodge and Sons, Issue Division.

Endorsed: Mail Room, U. S. Patent Office, Dec. 1, 1900.

* * * * * * *

(Here follow three prints, endorsed respectively as follows: "Claude & Hess 625,580, Paper No. —. Print —. Filed May 17 1899" which are omitted at this point for the reason that they are the same as the drawing at page 556 of this printed record.)

(Here follows drawing, marked page 556, and specification, marked pages 557 and 558.)

559 Acetylene.
Acetone.
Liquefied.

1897.

Contents.

½. Application, 1 papers. O. K.
1. Reject'n, April 6, 1897.
2. Amend't A, July 9, 1897.
3. Reject'n, August 23, 1897.
4. Amendment B, Sept. 17, '97.
5. Reject'n, October 22, 1897.
6. Letter, Nov. 2, '97.
7. Rejected, Dec. 16, 1897.
8. Amend't C, Ap'l 15, 1899.
9. Rejection, April 15, 1899.
10. Appeal Card, May 9, '99.
11. Asso. Power of Att'y June 28, '99.
12. Amendment D, Sept. 18, 1899.
13. Letter, Sept. 28, 1899.
14. Letter, Oct. 27, 1899.
15. Letter, Nov. 4, 1899.
16. Letter, Nov. 24, 1899.
17. Petition, Dec. 14, 1899.
18. Notice of Hearing, Dec. 14, 1899.
19. Examiner's Statement, Dec. 19, 1890.
19½. Notice of Postpon'm't, Dec. 26, 1899.
20. Brief for Petitioner, Jan. 3, 1900.
21. Com'r's Decision, Jan. 17, 1900.
22. Amend't E, Jan. 18, 1900.
23. Rejection, Jan'y 23, 1900.
24. Amend't F, June 12, 1900.

Title: Improvement in Apparatus for Storing and Distributing Acetylene Gas.

Contents.

Application, — Papers.
1.
2.
3.
4.
5.
6.
7. Old Wrapper
8. With Record of Actions
9. Inside.

560
10.
11.
12.

13.
14.
15.
16.
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19.
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21.
22.
23.

Title: Improvement in —.

Endorsed on back in red ink: U. S. Patent Office. Copy made Dec. 8, 1910. 209,961/10.

CLERK'S NOTE.—The Following Exhibits, viz:
Defendants' Exhibit "Prest-O-Lite" tank;
Defendants' Exhibit Sectioned "Prest-O-Lite" tank;
Defendants' Exhibit Opened "Prest-O-Lite" tank;
Defendants' Exhibit "Fireball" tank;
Defendants' Exhibit Sectioned "Fireball" tank;
Defendants' Exhibit Opened "Fireball" tank;
Defendants' Exhibit Sectioned Avery tank;
Defendants' Exhibit Sectioned "Searchlight" tank;
Defendants' Exhibit Rosso Gas tank;
Defendants' Exhibit Plumber's torch;
Defendants' Exhibit Bottle of Seltzer water; and
Defendants' Exhibit Sectioned Seltzer bottle valve;

Are Not Inserted Here, for the Reason that Same are Physical Exhibits and are Transmitted to the Clerk of the U. S. Circuit Court of Appeals for the Eighth Circuit with this Transcript.

CLERK'S NOTE.—Defendant's Exhibit Sectional Drawing of Seltzer Bottle Valve is not inserted here, for the reason that same appears on page 230 of this transcript.

CLERK'S NOTE.—Defendants' Exhibit Nitrous Oxide Tank is not inserted here, for the reason that same is a physical exhibit and is transmitted to the Clerk of the U. S. Circuit Court of Appeals for the Eighth Circuit with this transcript.

561 CLERK'S NOTE.—Defendants' Exhibit Drawing of Nitrous Oxide Tank is not inserted here, for the reason that same appears on page 229 of this transcript.

CLERK'S NOTE.—The Following Exhibits, viz: Defendants' exhibit Sample of Acetone, and Defendants' exhibit Sample of "Terpeline," are not inserted here, for the reason that same are physical exhibits and are transmitted to the Clerk of the U. S. Circut Court of Appeals for the Eighth Circuit with this transcript.

(DEFENDANTS' EXHIBIT DEFENDANTS' PATENT.)

UNITED STATES OF AMERICA,
DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the Records of this Office of the Letters Patent of Clarence De Witt Lukens, Assignor of One-half to David L. Soloman, Number 987,000, Granted March 14, 1911, for Improvement in Valves.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the City of Washington, this 29th day of March, in the year of our Lord one thousand nine hundred and eleven and of the Independence of the United States of America the one hundred and thirty-fifth.

[SEAL.] F. A. TENNANT,
Assistant Commissioner of Patents.

No. 987,000.

THE UNITED STATES OF AMERICA:

To all to whom these presents shall come:

Whereas Clarence De Witt Lukens, of St. Louis, Missouri, has presented to the Commissioner of Patents a petition praying for the grant of Letters Patent for an alleged new and useful improvement in Valves, he having assigned one-half of his right, title, and interest in said improvement to David L. Soloman, of St.
562 Louis, Missouri, a description of which invention is contained in the specification of which a copy is hereunto annexed and made a part hereof, and has complied with the various requirements of Law in such cases made and provided, and

Whereas upon due examination made the said Claimant is adjudged to be justly entitled to a Patent under the Law:

Now therefore these Letters Patent are to Grant unto the said Clarence De Witt Lukens and David L. Soloman, their heirs or assigns for the term of Seventeen years from the fourteenth day of March, one thousand nine hundred and eleven, the exclusive right to make, use and vend the said invention throughout the United States and the Territories thereof.

In Testimony Whereof, I have hereunto set my hand, and caused the seal of the Patent Office to be affixed at the City of Washington this fourteenth day of March, in the year of our Lord one thousand nine hundred and eleven, and of the Independence of the United States of America the One hundred and thirty-fifth.

[SEAL.] E. B. MOORE,
Commissioner of Patents.

(Here follows drawing, marked page 563, and specification, marked pages 564 and 565; also lithographs, marked page 567.)

563

C. DE W. LUKENS.

VALVE.

APPLICATION FILED FEB 11, 1910.

987,000.

Patented Mar. 14, 1911.

Fig. 1.

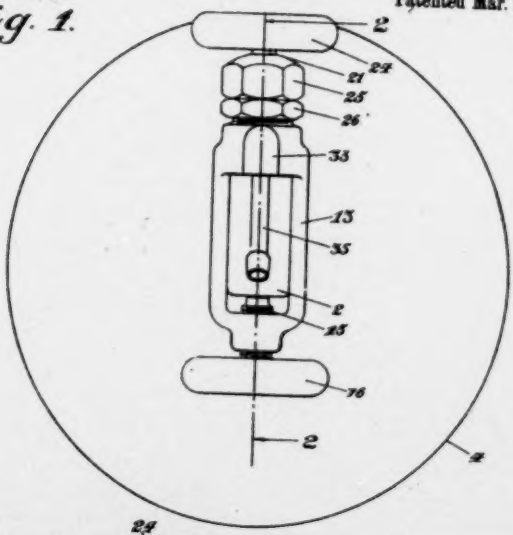
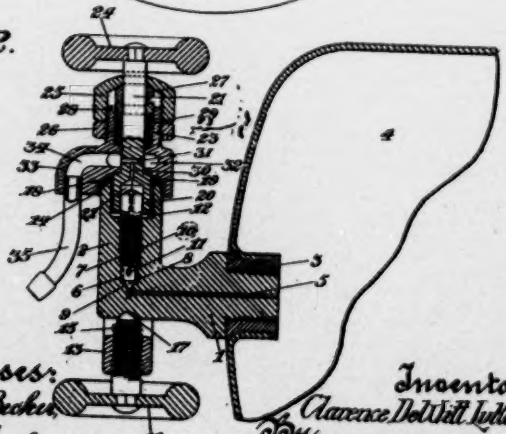


Fig. 2.



Witnesses:
Chas A. Becker
George G. Anderson.

Inventor:
Clarence DeWitt Lukens
By Albright & Wagner
His Attorneys

UNITED STATES PATENT OFFICE. 564

CLARENCE DE WITT LUKENS, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO DAVID L. SOLOMAN, OF ST. LOUIS, MISSOURI.

VALVE.

987,000. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed February 11, 1910. Serial No. 543,214.

To all whom it may concern:

Be it known that I, CLARENCE DE WITT LUKENS, a citizen of the United States, residing at the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in Valves, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to valves and has for its object to provide a valve which is adapted to control the passage of gas or liquid from a reservoir and which is particularly intended to be used to control the passage of acetylene or other gas from a reservoir in which the gas is stored or generated for the purpose of supplying the lamps of an automobile, railway coach, headlight of a locomotive, boat, etc.

In the drawings forming part of this specification, in which like numbers of reference denote like parts wherever they occur, Figure 1 is an end elevation of a reservoir to which this valve is attached; and Fig. 2 is a sectional view on the line 2—2, Fig. 1.

The neck 1 of the main valve-body 2 is preferably screw-threaded to fit in a screw-threaded bushing 3 of the reservoir 4. A passage 5 in neck 1 communicates with the interior of reservoir 4 and, also, with an opening 6 in the main valve-body 2. A portion of opening 6 is screw-threaded to receive a screw-threaded stem 7 of a needle valve 8, which is movable toward and away from the valve-seat 9 in said opening 6. A passage 10 extending longitudinally in stem 7 terminates in an aperture 11 which extends transversely through said stem. Said aperture communicates with opening 5, and, when valve 8 is moved away from seat 9 in the manner hereinafter described, the gas passes from passage 5 into opening 6 and enters aperture 11 from which it passes through passage 10. The upper end of stem 7 is preferably squared and extends into the cup 12 in the upper end of valve-body 2.

A yoke 13 encircles the valve-body 2, and is dished at 14 to fit over the upper end of said valve-body. A screw 15, bearing a hand-wheel 16 for the purpose of turning same, extends through a screw-threaded opening in yoke 13. An end of said screw seats in a depression 17 in the lower end of valve-body 2 and holds said yoke firmly in place on said valve-body. When the hand-wheel 16 is turned in the direction to draw the end of screw 15 out of depression 17, the yoke 13 can be removed from the valve-body 2. An ordinary packing ring 18, which is placed in an annular groove 19 in the dished portion 14 of yoke 13, is held snugly against the upper end of valve-body 2 and prevents the gas from leaking out of cup 12.

A socket 20 on the end of stem 21 projects into cup 12. Said socket is provided with a squared opening 22 into which the squared end of stem 7 extends, and, when said socket is rotated, stem 7 is caused to rotate therewith, thereby moving valve 8 toward or away from seat 9. Said stem 21 extends through a stuffing box 23 in the upper end of yoke 13, a hand-wheel 24 being fastened to the upper end of stem 21 for the purpose of turning same. A cap 25, which encircles stem 21, is screw-threaded to fit the screw-threaded upper end of yoke 13, and is held in any desired position on said upper end of yoke 13 by means of a lock-nut 26. Said cap presses a split ring 27 against a packing ring 28 which retains the packing 29 in the stuffing-box 23. The upper end of ring 28 is preferably tapered to form a seat for the tapered lower end of split ring 27, so that the pressure of cap 25 causes said ring 28 to press ring 27 snugly around stem 21.

A passage 30 in stem 21 communicates with the opening 22 in socket 20 and terminates in an aperture 31. Said aperture 31 extends transversely through stem 21 and communicates with a chamber 32 within the valve-body 2. A lug 33 on yoke 13 is provided with a passage 34, which communicates with chamber 31. A pipe 35 is fastened in passage 34, and is arranged to deliver the gas to a pipe or hose (not shown in the drawings) which leads to the lamps.

The operation of the valve is as follows: When the hand-wheel 24 is turned in one direction, the socket 20 rotates the stem 7, thereby causing valve 8 to move away from its seat 9. The gas passes through passage 5 into opening 6, then through aperture 11 and passage 10 into the opening 22, from which it passes through passage 30 and aperture 31 into chamber 32 and then out through passage 34 and pipe 35. When the hand-wheel 24 is turned in the opposite direction, the socket 20 rotates the stem 7,

565 whereby the valve 8 is caused to move against its seat 9 in order to retain the gas in passage 5.

I claim:

1. In a valve, a casing formed with a chamber at its outer end, a valve having a longitudinal passage threaded in the casing and having a head which extends in said chamber, a packing engaging wall surrounding said chamber, a member having an end seating on the packing of said wall, said member being formed with a chamber and an outlet communicating with said last named chamber, a valve rotating member carried by said first named member and having an end thereof formed to engage said valve head to rotate same, said valve rotating member being formed with a passage which communicates with both of said chambers, and means to hold said first named member in engagement with said casing.

2. In a valve, a valve body having a threaded opening, a valve threaded in said opening and formed with a longitudinal passage, a body secured to the valve body and formed with a chamber, and means carried by the second named body to rotate said valve, said valve rotating means being formed with a passage which communicates with the valve passage at one end and with the chamber of the second named body at its opposite end.

3. In a valve, a casing having a threaded opening therein with a chamber at each end of said opening, a valve threaded in said opening having an angular head on its stem which projects in one of said chambers, said valve stem being formed with a longitudinal passage which extends from a point at the inner end of the valve through said angular head thereof to thereby establish communication between said chambers through the valve stem, a body engaged with said casing and formed with a chamber, and a valve operating member rotatably carried by said body, said member having a stem formed with a socket on its lower end, said socket conformably receiving and engaging over said angular head of said valve, said stem of said member being formed with an aperture which communicates with the body chamber, and with a passage which establishes communication between the socket and aperture.

4. In a valve, a casing having a chamber therein and a threaded opening communicating with the chamber, a valve threaded in the opening having an angular head which projects into the chamber, said valve having a longitudinal passage, a body secured to the casing and formed with an outlet, and a rotatable member carried by said body to actuate said valve, said member having a socket which conformably fits over said angular head of the valve to grip same, said member having a passage which communicates with the outlet at one end and extends into said socket to communicate with said valve passage.

In testimony whereof I have affixed my signature in presence of two witnesses.

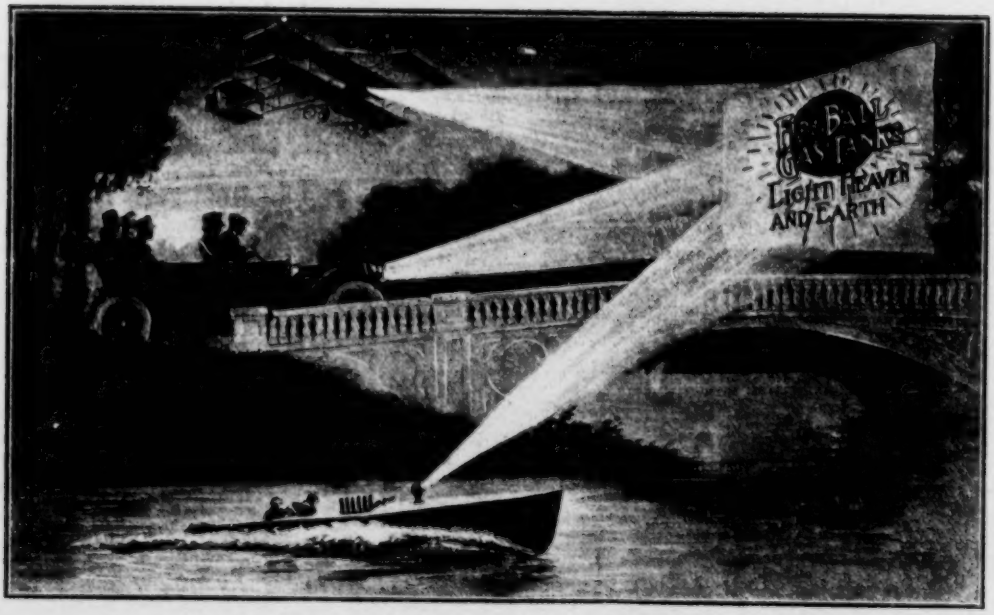
CLARENCE DE WITT LUKENS.

Witnesses:
GLADYS WALTON,
DAVID LEON SOLOMAN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

(Defendants' Exhibit, "Fireball Pamphlet".)



"It's the Tank Behind the Light that Makes it Bright"

"It's the Tank Behind the Light that Makes it Bright"

EVERY OWNER or operator of an Automobile, Motor Boat, Motor Cycle or Aeroplane should acquaint himself with the new Fire-Ball Gas Tank and its many patented features. We enumerate on the following pages the advantages of this perfected tank.

Fire-Ball Gas Tank and Illuminating Co.

Saint Louis Branch: 5010 Delmar Blvd., SAINT LOUIS, U. S. A.

Bell and Kinloch Phones, Local and Long Distance

Note the Advantages of the Fire-Ball Gas Tank:

Superior Construction

The Fire-Ball gas tank is constructed of seamless drawn bronze of great tensile strength, **lined with pure block tin,** and tested to an internal pressure of 750 pounds to the square inch—three times the maximum pressure exerted by the gas.

Lighter Weight Greater Gas Capacity

The Fire-Ball gas tank is lighter in weight and **contains a greater number of "light hours"** than any acetylene gas tank of same size. This is accomplished by its patented internal construction and the use of the newly discovered gas solvent "Terpeline," the exclusive rights to this solvent being owned by the Fire-Ball Gas Tank and Illuminating Company.

Rapidity of Interchange Without Wrenches or Tools

The Fire-Ball gas tank can be detached and replaced in less than a minute, without using wrenches or tools. This rapidity of interchange will be appreciated by all motorists.

Efficiency

The Fire-Ball valve and yoke, connecting tank with acetylene lamps, is constructed **primarily to prevent leakage;** the connection is therefore guaranteed absolutely gas-tight.

Key Unnecessary Perfect Adjustment

Fire-Ball gas tanks require no key to control the flow of gas; the small wheel on top of yoke adjusts the light to a nicety. This perfect adjustment enables the operator to turn the light so low during waiting periods of the car, that only an infinitesimal quantity of gas is consumed.

Light Unaffected by Rough Roads, etc.

The flow of gas to the lamps is unaffected by rough roads or vibration, as the valve adjustment is so constructed that it remains stationary, preventing the light from flaring or going out.

Gas Always Retains Normal Density

The patented internal construction of the Fire-Ball Tank prevents marked thermal changes—the gas being the same temperature under all atmospheric conditions; thus retaining its normal density, insuring dependability and efficiency.

Elegance of Appearance

The Fire-Ball gas tank, being constructed of seamless bronze, highly polished, is easily kept in this condition; thus its original elegant appearance is always maintained—harmonizing with the brass trimmings of the car. Steel with copper plating, heretofore used in tank construction, rusts easily, and detracts from the appearance of the car.

Carefully Wrapped and Packed

Fire-Ball gas tanks are carefully wrapped and packed in a heavy card board cartoon, preventing damage to the tank in shipment.

Superior Facilities and Service

The Fire-Ball Gas Tank and Illuminating Co. will maintain Filling Stations and Branches in the principal cities of the United States and foreign countries, giving prompt and efficient service. The patentees and manufacturers of the Fire-Ball gas tank guarantee this tank superior in safety, efficiency, appearance, construction, economy and service, to any tank manufactured since the illuminating properties of acetylene gas were discovered.

PRICES OF FIRE-BALL GAS TANKS

Size 10, containing 10 cubic feet (Motor Cycle and Aeroplane Special)	$12.50
" 40, " 40 " " (Standard Auto Type)	30.00
" 100, " 100 " " (For Motor Boats)	60.00
Price of **Fire-Ball Brackets**, per set, complete	2.50

PRICES FOR RECHARGING

Style 10	$ .50
" 40	2.00
" 100	4.00

NOTE—The Fire-Ball Gas Tank & Illuminating Company has specially designed brackets made of rolled brass, highly polished, which harmonize with the tank and trimmings of the car. These brackets can be attached to either the running board or side of machine. Tools are unnecessary to attach or detach tank when **Fire-Ball Brackets** are used.

St. Louis Branch: 5010 Delmar Blvd.

568–575 Filed in the Circuit Court on Oct. 27, 1911.

(DEFENDANTS' EXHIBIT "PREST-O-LITE CIRCULAR.")

Carl G. Fisher, President. Frank E. Sweet, Vice President. James A. Allison, Sec'y & Treas.

Prest-O-Lite.

The Prest-O-Lite Co., Main Offices and Factory, 227-239 E. South Street, Indianapolis, Ind.

The Light that Never Fails—Prest-O-Lite.

Prest-O-Lite.

Branch Offices.

Atlanta, 402 Equitable Bldg.
Baltimore, 116 W. Mt. Royal Ave.
Boston, 607 Boylston St.
Buffalo, 961 Main St.
Chicago, 2613 S. Michigan Ave., 509 Rush St.
Cincinnati, 118 E. Ninth St.
Cleveland, 2032 Euclid Ave.
Dallas, 2021 Main St.
Detroit, 872 Woodward Ave.
Jacksonville, 810 Laura St.
Kansas City, 1728 Grand Ave.
Los Angeles, 314 W. Ninth St.
576
Milwaukee, 18-20 Martin St.
Minneapolis, 109 So. Tenth St.
New York, 2104 Broadway.
Omaha, 1919 W. Farnam St.

The Facts Regarding the Patent Situation on Acetylene Gas Tanks.

On April 25th Judge Kohlsaat of the United States Circuit Court in Chicago, in our suit against another manufacturer,—we asking for a preliminary injunction,—decided that for the Purposes Of That Hearing he would declare that the patents under which we operated Had Expired, by reason of the expiration of the British patents.

On the day after, Judge Dennison of the United States Circuit Court in Detroit, in a case against another manufacturer involving exactly the same point, where exactly the same arguments were made on both sides, and exactly the same briefs submitted, decided that our patents Did Not Expire with the foreign patents.

We wish particularly to call your attention to the fact that when the Avery Portable Lighting Company were manufacturing Autogas tanks, we brought suit in Milwaukee before Judge

Philadelphia, 1418 Race St.
Pittsburg, 3580 Grant B'l'v'd.
Providence, 54 Aborn St.
St. Louis, 3685 Olive St.
St. Paul, 161 West Sixth St.
San Francisco, 58 Van Ness Ave.
Seattle, 738 Fidalgo St.

Charging Plants.

Atlanta.
Cleveland.
Dallas.
E. Cambridge.
Hawthorn, Ill.
Indianapolis.
Long Island City.
Los Angeles.
Oakland.
Omaha.
Seattle.
577

Island Possessions.

Hawaiian Islands, Honolulu; Acetylene Light & Agency Co.
Philippine Islands, Manila; Philippine Acetylene Co.
Porto Rico, San Juan.

Foreign Agencies.

Canada, Toronto, Ontario; Commercial Acetylene Co., Vancouver, B. C.; Compressed Gas

Quarles of the United States Circuit Court, asking for a preliminary injunction, and Judge Quarles Refused to grant us a Preliminary Injunction just the same as Judge Kohlsaat has refused in this later case.

We want you to remember, however, that when the Final Hearing came up, Judge Quarles decided in our favor, and as a result the Avery Portable Lighting Company was enjoined from manufacturing or in any way handling Autogas tanks, even to the refilling of those already manufactured.

Dealers who purchased Autogas tanks were at considerable expense making good with their customers,—or in case they refused to make good, lost a great deal of business.

We firmly believe that when the last word is heard on the patent situation, the courts will hold that our patents are good and valid as they have held in the past; and as the U. S. Circuit Court at Detroit held last week. Dealers who purchase tanks of any other manufacturer will undoubtedly suffer a loss.

Then, when the patents are held good, all other manufacturers will immediately quit the gas tank business, leaving their customers "holding the sack" with empty and worthless tanks.

Our rights under these patents are leased from the Commercial Acetylene Co., to whom we pay large royalties. We have now arranged to pay no more royalties until the validity of the patents is definitely decreed by the higher courts. We are therefore immediately giving the dealer the benefit of this saving in roy-

Co., Ltd.
Cuba, Havana.
Mexico, City of Mexico.
England, London; Acetylene Illuminating Co.
Germany, Berlin, "Autogen."

alty as you will note by the enclosed *New List Of Prices.*

Yours very truly,
THE PREST-O-LITE COMPANY.
JAMES A. ALLISON,
Sec'y and Treas.

J. A. A. M.

Envelope: Prest-Tire Tube, Price (Complete) $3, Prest-O-Lite Co., Indianapolis, Ind. Form 55.
Postmarked: Indianapolis, Ind., May 13, 10-AM, 1911.
Addressed: Buckeye Garage, 6112 Euclid Ave., Cleveland, O.

Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

DEFENDANTS' EXHIBIT "SCIENTIFIC AMERICAN."

Storage of Compressed Acetylene.

Ever since illuminating gas came into general use, attempts have been made to compress it into portable steel cylinders or flasks for use on vehicles and for country residences. The results ob-
578 tained, however, were unsatisfactory, for illuminating gas is generally a mixture of many different gases, some of which easily liquefy under pressure while others, like methane, hydrogen etc., can be liquefied only at a low temperature. When these cylinders are connected up for use, the gas fed to the burner will vary greatly as to its heating and illuminating properties. Then there is always a certain part generally as much as ten per cent, that will not volatilize but remains as a tarry deposit in the cylinder. Theoretically, acetylene is admirably adapted for this purpose for it is homogeneous in its composition leaves no deposit in the cylinder, and when properly fed to a suitable burner it gives intense brilliant white light which is superior in many ways to any other form of illuminant.

The introduction of acetylene for lighting and other industrial purposes, is of rather recent date. Prior to 1895, this gas was scarcely known outside chemical laboratories, but the discovery of calcium carbide and the process of making it, made this gas available for commercial use. Acetylene belongs to the class of unsaturated hydrocarbons and is unstable except at moderate pressures and temperatures. Its critical temperature is 37 deg. C., and pressure 68 atmospheres however; it may be liquefied by a pressure of 21.53 atmospheres if the temperature is reduced to 0 degrees, and one cubic foot of this liquid would produce 400 cubic feet of gaseous acetylene at atmospheric pressure. If acetylene could be safely compressed and stored in steel cylinders in this cheap and simple manner, its use today would be much more general than it is but liquid acetylene at

normal temperatures is about as touchy as fulminate of mercury, and its disruptive power equal to that of nitroglycerine. Early attempts to handle acetylene in this form were fraught with numerous violent explosions. Usually it was impossible to discover the primary cause of the explosion, for the witnesses rarely ever survived the disaster, but it is probable that it was due to heat generated in manipulating the outlet valve or to some blow on the cylinder.

Acetylene under pressure of less than two atmospheres or thirty pounds per square inch is practically safe against explosion. Should the gas be brought in contact with a wire at white heat or should a priming of fulminate of mercury be exploded in the cylinder of gas at this pressure, the gas in immediate contact with the wire of fulminate will be decomposed, but the explosion would not be transmitted to the whole mass. When under greater pressure, an explosion caused by heat or concussion at one point is instantly transmitted through the whole mass, causing a violet explosion. If the
579 gas is in the liquid form, the pressure generated is enormous amounting to 5,000 or 6,000 atmospheres.

In exploding, acetylene disintegrates and hydrogen is set free and usually takes fire as it comes in contact with the air, while the carbon is thrown down in the form of an extremely fine impalpable powder. It is possible that carbon obtained in this manner, called "acetylene black" by Hubou, may yet replace lamp black for delicate work. It has a pure black cast or tint, is free from grease, and is specially suited for making black paint, printers' ink and for printing calico.

About 1897, Georges Claude, of liquid air fame, and another Frenchman, M. A. Hess, discovered that acetone, a combustible liquid resembling wood alcohol, would readily absorb acetylene gas. In putting this discovery in practical use, they partially filled the cylinder with acetone and then forced the gas in under a pressure of about twelve atmospheres. At this pressure and at ordinary temperature, the acetone will absorb about 300 times its own volume of the gas. When the valve is opened the pressure is reduced and the surplus gas passes off to the point of use, such as burners leaving the acetone unaltered and capable of taking up a fresh charge of gas. In all cases where acetone is used, the valve must be kept at the top to prevent its escape. No trouble, however, would result should it get mixed with the gas, since it itself is inflammable. The gas stored in this way is safe against explosion so long as the cylnder is full, but this process is open to one serious objection. Acetone increases in volume when it absorbs the gas. A cylinder having only forty-seven per cent of its volume filled with acetone at the beginning will be entirely filled with liquid when fully charged with the gas, and when the gas is escaping it shrinks, so that a cylinder which has been in use for some time will have a space at the top filled with gas under a dangerous pressure. Under a pressure of ten atmospheres (150 pounds) the presence of the acetone is an element of safety, for the acetylene dissolved therein does not explode, but should the pressure be over twenty atmospheres (300 pounds) it does explode and add it- heat of combustion to that evolved by the acetylene. While this

process greatly reduced the chances of explosion, still the use of acetone alone was too dangerous to make the process a commercial success.

A few years later, Edmound Fouche, of Paris, added the final element which made compressed acetylene a commercial possibility. He first placed in the cylinder a filler of some inert porous substance, such as asbestos, infusorial earth, or charcoal, etc., and then added the acetone in which the gas was absorbed as before. In this
580 way he prevented the existence of any considerable volume of compressed gas at any one point. In the illustration is shown one form of filler now in use. It consists of disks of asbestos entirely filling the cylinder. This filler decreases the gas holding capacity about twenty per cent, but its addition renders the gas entirely safe against explosion. In practice, these cylinders charged under ten atmospheres will hold about 100 volumes of the gas measured at atmospheric pressure. A platinum wire passing through the cylinder and heated electrically to a white heat has no other effect than to decompose the gas in immediate contact with it, for the porous filler effectually prevents the further spread of the explosive wave. The porous filler alone, when composed of charcoal forms a perfectly safe medium for the storage of the compressed gas if the pressure does not exceed seven atmospheres. At this pressure according to Capelle, a cylinder of one liter capacity will hold eight to nine liters of acetylene measured at atmospheric pressure. This is a cheap method and may be used advantageously where a large reserve supply is not needed. When the cylinders are exhausted they are usually sent to some central charging station. Here acetylene from the generator, after being purified, is compressed generally in two stages, carefully cooled and then forced into large storage tanks which also contain a porous filler and acetone. The exhausted cylinders are connected up and charged directly from these tanks.

The consumption of compressed acetylene has become enormous in recent years. Small portable generators are not practicable in winter, as the water is apt to freeze, but the solution of acetone and acetylene will not freeze during the coldest weather. Today no automobile is considered complete without a cylinder of acetylene for lighting purposes. The cylinders are also extensively used in lighting railway cars, boats, buildings, and for oxy-acetylene flame apparatus. As yet they are used but to a limited extent on locomotives for supplying the head lights, but this field may widen in future, for the light produced by acetylene comes nearer to being the same as sunlight than any other form of artificial illuminant and hence does not distort or alter the colors of the various signals used in railway work.

The discoveries of Claude, and Hess, and Fouche were patented in this country and as they dominate the only practicable process so far developed for storing compressed acetylene, they have been bitterly fought, but so far they have been sustained (see 166 Fed. R. 907). The courts have also decided that the recharging of an exhausted cylinder was an infringement of the patents (see 181

Fed. R. 387). These patents still have a number of years to run and constitute a valuable monopoly.

581 Endorsed: Filed in the Circuit Court on Oct. 27, 1911.

CLERK'S NOTE.—The following Exhibits, viz: Defendants' exhibit copy of Second Suckert affidavit, and Defendants' exhibit print of drawing in second Suckert affidavit, are not inserted here, for the reason that same appear on pages 87 and 89 of this transcript.

CLERK'S NOTE.—Defendants' Exhibit Sectioned "Fireball" Yoke is not inserted here, for the reason that same is a physical exhibit and is transmitted to the Clerk of the U. S. Circuit Court of Appeals for the Eighth Circuit with this transcript.

AFFIDAVITS FOR COMPLAINANTS.

(Affidavit of Oramel H. Skinner for Complainants.)

STATE OF INDIANA,
County of Marion, ss:

Oramel H. Skinner being first duly sworn, upon oath deposes and says:

I am the Oramel H. Skinner who has previously verified an affidavit in this action.

I herein reiterate and reaffirm all of the facts set forth in my previous affidavit, and in addition thereto swear to the following facts:

The Valve Employed by the Complainants & Defendants.

Both complainants and defendants employ on their tanks a needle valve. This valve forms the function of reducing the pressure of the gas flowing therethrough from a high pressure on the outside of the valve. That is, the gas by friction in its passage through the small tapering orifice which is adjusted for the purpose, is reduced from a pressure of two hundred fifty (250) pounds per square inch on the high side of the valve to a pressure of less than three ounces on the low side of the valve. For this purpose the needle valve used by Complainants and Defendants is just as much a reducing valve [*use-*] *by complainants and defendants is just as much a reducing valve* and serves just as much for this purpose as the most highly organized and complicated automatic pressure valve known.

582 Furthermore, the other function performed by this valve is that of delivering the gas which passes therethrough at substantially uniform pressure for the required periods of using, so that the illumination caused by the combustion of the acetylene

at the burner will be constant and non-fluctuating. This, the needle valve of the defendants and complainants performs as satisfactorily under the conditions that exist in the Prest-O-Lite and Fireball gas tanks as would any more highly complicated automatic regulator.

The only function that the automatic pressure regulator will perform under the condition- of use that exist in these acetylene gas tanks is that of providing a constantly varying amount of acetylene at substantially uniform pressure. To meet their requirements, automatic pressure regulators are used in steam heating plants and illuminating gas plants in houses. There, the supply of gas or steam constantly varies as one or more burners or heaters are turned on or off. At the same time the pressure must be substantially unif-rm.

In the condition of use in the Prest-O-Lite and Fireball gas tanks on automobiles, the amount of gas used does not vary. It is constant. That is,—one cubic foot of gas per hour must be delivered by the package at substantially uniform pressure. The longest possible continuous use that these packages require never exceeds over eight burning hours. I have proved by constant experiments both in actual practice and in the laboratory that the needle valve on a Prest-O-Lite tank produces this. Moreover, the usual length of a continuous run called for in these gas packages very rarely exceeds four continuous hours.

The Safety and Practicability of a Gas Package without the Porous Asbestos Discs.

Criticism has been constantly directed at the Claude & Hess gas package without the asbestos disc, on the ground that such a package is dangerous and impracticable and that this is so because above the solution free acetylene forms in a highly compressed state and acetylene in this condition is dangerous. I deny this on theory and from practical experience, and from my knowledge of the practical use of these packages.

The word "dangerous" is a relative term. Under some circumstances a fish bone may be dangerous. The gas package without the asbestos disc under the conditions hereinbefore related would be only dangerous in contact with live heat. That is,—over a temperature of 1400 degrees Fahrenheit. In case of fire in a garage or upon an automobile these packages would be liable to explosion and consequences resulting therefrom.

However in ordinary use no such result could or has ever occurred from use of these packages with a pocket containing
583 free compressed acetylene. The normal temperature at which they are used in practice never exceeds 100 degrees Fahrenheit. At this heat there is no possibility of any explosion of disastrous results.

Prior to January 1909 The Prest-O-Lite Company had put out over forty thousand of these gas packages and the Avery Portable Lighting Company sixteen thousand thereof, all of which were fitted with asbestos wicking, which, through the action of the liquid

acetone sagged and left large free spots at the top of the disc. In use free acetylene under large compression collected in these packets and the same condition existed there as would be found in the Claude & Hess gas package without the asbestos discs as described in defendants' affidavits. In my experience, which dealt with such matter, none of these Prest-O-Lite and Autogas tanks exploded except when subjected to live heat such as fire or live sparks, and they were in continuous use for over three years. On account of danger from automobile fires and train wrecks, by agreement with the Bureau of the Railroad Transportation we framed an ordinance compelling the use of solid asbestos discs to remove even this possibility of disaster.

These Prest-O-Lite and Autogas tanks, in the condition which I have just described, were in constant use and were being transported constantly up to the time these asbestos discs were removed, and it was upon their experience that the present popularity of the Prest-O-Lite gas tank was founded. That is, from twenty thousand (20,000) the sale has leaped to four hundred thousand (400,000).

Moreover, in my laboratory practice I constantly employ the Claude & Hess package without the asbestos disc in experiments with heat and I have fully verified my statements hereinbefore set forth. That is unless the package comes in contact with live heat at a temperature of over 1,400 degrees Fahrenheit there is no possibility of disaster.

Moreover, of my own knowledge I know that the United States Government employed in buoy service the said Prest-O-Lite package without the asbestos packing and no accidents or disaster [-as] ever resulted from its use, but on the other hand their experience had been uniformly satisfactory.

The asbestos disc or package is solely an improvement upon the Claude & Hess gas package and removes the risk of explosion in live heat and also enables the package to be used upon automobiles where there otherwise would be a slopping of the contents through the valve in use. These asbestos discs serve the purpose of holding the supersaturated solution away from the mouth outlet and for that purpose forms the function of the diaphragm in the Claude & Hess patent drawing.

I have read the British and French Letters patent to Claude & Hess and am thoroughly familiar with them. I am also
584 familiar with the United States Patents to Claude & Hess in suit. In my opinion the British and French Letters Patent to Claude and Hess patent the process or method of dissolved acetylene in liquid, whereas, the United States Claude & Hess Patent patents an apparatus which is the result of employing that process and certain elements of which are the apparatus used in performing that process. These are entirely distinct inventions.

The fundamental discovery which made the Claude & Hess package possible was the discovery of the enormous value of acetone as a solvent of acetylene and the remarkable affinity of this gas under pressure to this liquid. That is, the solvent value of acetone is twenty-five times its own volume at atmospheric pressure whereas

the next highest value of any liquid is that of alcohol, which is six times its own volume at atmospheric pressure. This discovery of Messrs. Claude & Hess is recognized by all of the well known authority- on acetylene including Lews and Leeds & Butterfield, who uniformly ascribe to Messrs. Claude and Hess this discovery. It is this remarkable affinity of acetylene to acetone that makes the Claude & Hess package valuable as a lighting apparatus, and has rendered commercial a dangerous gas such as acetylene.

(Signed) ORAMEL H. SKINNER.

Sworn to before me this 26th day of October 1911.

MARTHA H. SMITH, [SEAL.]
Notary Puvlic.

My commission expires Feb. 8, 1914.

Filed, October 27/1911. James R. Gray, Clerk.

(*Affidavit of Frederick W. Russe for Complainants.*)

STATE OF MISSOURI,
City of St. Louis, ss:

Frederick W. Russe, being first duly sworn, on oath deposes and says:

I am a chemist with a degree of Ph. D. from Harvard University, and am connected with the Mallinckrodt Chemical Works, of St. Louis, Missouri, as a chemist there. I have had a large experience with laboratory work at the said Mallinckrodt Chemical Works and elsewhere, and among my duties there is the anaylsis of chemical compounds.

On the 3rd day of June, 1911, Theodore Du Moulin personally delivered to me in the city of St. Louis a Fire Ball Gas tank No. 963. This said Fire Ball Tank was marked with the letters "T. M. 6/3/11". I thereupon subjected this said Fire Ball gas tank No. 963 to the following treatment.

585 The valve attached to the tank I connected with a long spiral condenser cooled with ice in such a manner that the gas from the tank would pass through the condenser, and all liquid contents by means of the iced spiral would be collected in a bottle from the open end of the spiral.

The purpose of the condenser was to condense any of the solvent which might come over with the gas.

About 300 c. c. of liquid was obtain- in completely emptying the tank from the initial pressure of 238 pounds down to zero. A little of this liquid was produced by condensing the vaporized solvent from the gas, but the greater portion was the result of collecting the spray caused by the mechanical carrying of the solvent from the cylinder by the gas.

This liquid so collected, and amounting to about 300 c. c. I subjected to fractional distillation, and found to consist of two distinst components.

First. A low boiling fraction which constituted 92% of the total liquid.

Second. A high boiling fraction which constituted the remaining 8%.

The Low Boiling Fraction.—This fraction I found to consist of Acetone, and was positively indentified by the following tests:

Boiling Point.—Most of the material boiled between 55 & 57° C. all under 70° C. This corresponds with the boiling point of Commercial Acetone as found in the market.

Odor.—Very distinct and characteristic. Unmistakable.

Solubility in Water.—Miscible in all portions.

Iodoform Test.—By this test Acetone is indentified chemically by converting it into Iodoform: the result was positive and unmistakable.

The High Boiling Fraction.—This fraction I subjected to fractional distillation, and found to consist of about 50% boiling between 155 and 175° C. a large part of the remaining material charred when heated to a higher temperature.

The odor of this fraction was the odor of oil of turpentine, and the boiling point corresponded to oil of turpentine, however, a positive [indentification] could not be made as the amount of sample was to- small to admit of making complete tests.

When the gas had been completely removed from the tank, and the valve removed, I found that there was so little solvent left in the tank that none could separate itself and flow of its
586 own accord from the porous material with which the tank was filled. I had, however, found that all constituents of the liquid which had been collected as described above were completely and freely soluble in Ether. The tank therefore I thoroughly saturated with Ether, and after standing some hours drained it. The solution thus obtained I freed of its ether by gentle heat and analyzed the remaining liquid. This remaining liquid, which was the solvent, I found on analysis to be [indenti-al] to composition and constituents with the previously collected liquid described above. However, here also too small a portion of the high boiling oil was obtained to do more than establish its identity with the high boiling oil of the previously collected liquid.

This high boiling oil in addition to the boiling points given previously I found to be soluble in Ether, insoluble in Potassium Hydrate and in water. It also possessed a faint odor of Camphor, which suggested that Camphor had been added.

It is my opinion that this oil is present in too small a quantity to play an appreciable part in dissolving acetylene gas, the chief solvent is the Acetone, and this oil was probably added to disguise the odor of the Acetone.

The analysis does not justify the claim that the solvent is a newly discovered chemical substance, since it is a mixture consisting of at least 90% of acetone.

Gas.—The gas was positively indentified as Acetylene by converting it into copper acetylene by means of an ammoniacal solution of cuprous chloride.

Conclusion.

1st. The gas is Acetylene.

2nd. If the gas is allowed to flow from the cylinder at the normal rate of speed a small part only of the solvent is carried over.

3rd. The solvent is a mixture of Acetone and a high boiling oil in the proportion of approximately 10 to 1 and the high boiling oil is probably oil of turpentine, or a mixture in which turpentine is the chief constituent.

The valve attached to the outlet at the end of the said Fire Ball Gas Tank I found by test served as a means of controlling the said outlet thereby the acetylene might escape there through at substantially uniform pressure. This I found by actual experiment.

In my opinion, therefore, the said Fireball Gas Tank No. 963 constituted as an apparatus, a gas package.

The combination of a closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into
587 a solvent under pressure, said vessel having an outlet for the escape of the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and a means for controlling said outlet whereby the gas may escape therethrough at a substantially uniform pressure. All substantially as described in said Claude and Hess patent, specifically referred to in claim 1 thereof.

Also a prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel, and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent as the package is arranged *and* position for use, with a reducing valve, as specifically referred to in claim 2 of said Claude and Hess patent.

Also a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained with the solvent, and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, as specifically referred to in claim 5 of said Claude and Hess patent.

FRED W. RUSSE.

Sworn to before me this 27th day of October, 1911.

ALICE DIXON,
Notary Public.

My term expires Nov. 8, 1913.

Filed October 27th, 1911. James R. Gray, Clerk.

(*Affidavit of Theodore W. Smith for Complainants.*)

STATE OF INDIANA,
County of Marion, ss:

Theodore W. Smith being first duly sworn, upon oath deposes and says:

I am the Theodore W. Smith who has previously verified an affidavit in this action.

I herein reiterate and reaffirm all the statements made herein and swear that the same are true of my own knowledge.

In making the examination, an analysis of the liquid solvent distilled by me from the said Fireball Gas Tank No. 977, on or about the fifth day of June 1911 as stated in said former affidavit, I found that this solvent was a mixture composed of a number of compounds 98½% of which was acetone and the other 1½% was turpentine with a trace of methylated spirits.

588 I determined the percentage of acetone in the liquid by the standard method [know-] and used by chemists for determining such compounds; that is by precipating the acetone in the form of iodoform. This test is infallible both as to the quantity and nature of this compound and showed unquestionable the presence of 98% of this compound acetone present in the solvent distilled from tank No. 977. After the acetone was separated from the turpentine, the odor was unmistakably that of acetone. Everything about this liquid indicated that it was acetone and I am familiar enough with acetone from my constant experiments with the same that I am not easily mistaken therein.

THEODORE W. SMITH.

Sworn to before me this 26th day of October, 1911.

[SEAL.] MARTHA H. SMITH,
Notary Public.

My commission expires February 8th, 1911.

Filed October 27th, [1912]. James R. Gray, Clerk.

(*Affidavit of Francis E. Gallagher for Complainants.*)

COMMONWEALTH OF MASSACHUSETTS,
Suffolk, ss:

Francis E. Gallagher, being duly sworn according to law deposes and says as follows:

I am of full age, and reside in Newton, in the County of Middlesex and Commonwealth of Massachusetts. I am by profession a chemist and engineer. I studied chemistry at Cornell University, where I also pursued post graduate work after graduation. I was also a teacher of Physical chemistry at the same University. I later served as physicist at the Bureau of Soils of the Department

of Agriculture at Washington D. C. and as research chemist with the Berlin Mills Company at Berlin Mills, New Hampshire. In the latter position I was engaged in commercial scale experimental work along chemical and electro-chemical lines. Since 1907 I have been associated with Arthur D. Little Inc., Consulting Chemists and Engineers maintaining offices and laboratories in Boston, Massachusetts, of which corporation I am a member and director. In my professional capacity I am in charge of the resea-ch department of the corporation where I have personally worked upon or directed research upon a wide range of problems relating to many lines of the chemical and engineering industries. I have made a special study of the distallation industries from which I have derived a detailed knowledge and acquaintance with the volatile solvents.

589 I am a member of the American Chemical Society of which I am now a councillor. I am secretary of the Division of Industrial Chemists and Chemical Engineers and have served on the executive committee of the Northeastern section of the American Chemical Society. I am also a member of the Scientific Honor Society Sigma X I.

Between June 3, 1911, and September 6, 1911, I conducted an examination of Fireball Gas Tank 979. The results of my examination are embodied in a report entitled "Report to Keyes Winter on Contents of Fireball Gas Tank", dated September 6, 1911, signed, "Arthur D. Little Inc., F. E. Gallagher, research Chemist", covering thirteen typewritten pages including photographs, which report is annexed to this affidavit and marked "Exhibit A." The examination was done by me personally or under my intimate personal direction, and I depose of my own knowledge that the statements in said report are true and are a correct statement of said examination.

FRANCIS E. GALLAGHER.

Subscribed and sworn to on this twenty-fifth day of October 1911, before me.

[SEAL.] JOHN G. PALFREY,
Notary Public.

Filed, October 27th, 1911. James R. Gray, Clerk.

(EXHIBIT "A" TO AFFIDAVIT OF FRANCIS E. GALLAGHER.)

Arthur D. Little, Inc.,
Chemists and Engineers,
93 Broad Street, Boston.

F. E. G.-K. September 6, 1911.

Keyes Winter, Esq., 10 Wall Street, New York, N. Y.

DEAR SIR: In accordance with the instructions in your letter of June 3, we have proceed- with the examination of Fireball Gas

Tank No. 979, for the purpose of determining the amount and character of the gas and solvent which the tank contained.

Besides the serial number 979, the fireball tank received by us marked had on $_{\wedge}$ its head "T d M 6/3/11", while the gas connection and the valve were also sealed and marked in the same way. The outside box bore the tag of the Prest-O-Lite Company, St. Louis, Mo.—Theodore du Moulin, Representative."

590 The following indicates in a brief way the essential data which we have obtained as a result of our examination of this tank.

Actual pressure at 34° C	265	pounds
Tank gauge pressure at 34° C	273	"
Initial weight of tank	11,408	Grams
Weight of tank after escape of gas	10,411	"
Weight of gas	997	"
Weight of gas	2.19	pounds
Cubic feet of gas by meter 60° F. 30″ hg	28.026	
Solvent distilled from tank	2,900	C. C.

Composition of solvent:

Acetone (approximately)	95	per cent
Turpentine "	5	" "

Method of Procedure.

Discharge of Gas.

After weighing the tank, recording the pressure shown on the tank gauge and measuring the correct pressure on a tested gauge, the gas was discharged so as to maintain a good flame at two acetylene tip burners which were kept burning throughout the discharge period. The test meter used read to 0.001 cubic feet.

The temperature of the gas was measured at the outlet of the meter and the pressure of the gas in the pipe between the meter and the burners was determined by means of a water gauge.

From these several readings and the barometer reading the voluse of the gas was corrected to 60 degrees Fahrenheit, 30 inches of mercury.

During the discharge period on the first day, several photographs of the flame were taken to indicate the extent to which the valve on the gas tank served as a reducing valve. The valve and the flame were adjusted in the morning of the first day and were not disturbed for the remainder of that run, so that the photographs signify the diminution in the flame due entirely to the reduction of pressure in the tank.

The following log of the run is a record of the observations which we made during the four days when the tank was being discharged.

Data-discharge of Cylinder July 12 to 15 Inclusive.

Time	Meter Reading	Temperature °C.	Line Pressure Water Inches	Tank Gauge Pressure Pounds	Remarks
Wednesday					
2.30	82.952	33.2	5.0	272	Start
3.52	85.555	33.3	3.3	...	
4.51	87.152	33.3	2.7	200	Shut off over night
Thursday					
8.34	87.152	32.1	3.9	203	Photo—1 sec. exposure
9.30	89.235	32.1	3.7	180	
10.24	90.935	31.9	3.1	160	Photo
11.25	92.38	31.9	2.7	145	
12.25	93.835	32.0	2.3	134	Photo
1.40	95.4	32.05	2.0	120	
2.30	96.355	32.1	1.8	115	Photo
3.30	97.41	32.2	1.65	108	
4.28	98.4	32.2	1.45	101	Photo
4.59	98.875	31.9	1.35	100	

Tank valve not touched during the day.

592 **Fireball Acetylene Tank**

Data-discharge of Cylinder July 12 to 15 Inclusive.

Time	Meter Reading	Temperature °C.	Line Pressure Water Inches	Tank Gauge Pressure Pounds	Remarks
Friday					
8.35	98.875	30.5	3.9	110	(Took 2 samples for analysis
9.35	100.585	30.5	2.3	92	
1 10	103.03	30.4	4.85	70	Sample-tank valve opened
11.58	105.00	30.1	3.9	52	Sample
1 25	107.46	30.2	2.3	35	
2 20	108.88	30.2	2.1	27	
3.55	110.35	29.9	2.5	20	Tank valve opened
4.54	111.4305	29.9	3.0	13	Shut off over night
Saturday					
8 20	111.4305	28.9	3.5	18	Start
8.55	112.07	28.0	0.05	13	Flame ceased to burn
11.15	112.13	29.3	0.05	12	
12.15	112.16	28.6	0.03	12	Meter stopped

593 **Fireball Acetylene Tank**

Data-discharge of Cylinder July 12 to 15 Inclusive

Date	Average Temperature °C.	Average Barometer mm. Mercury	Average Line Pressure Ins. Water	Gas Metered Cu. Ft.	Volume at 30″ Hg. 60° F. Cu. Ft.
Wednesday	33.27	757.79	3.67	4.2	4.062
Thursday	32 045	762.36	2.395	11.723	11.161
Friday	30.2	765.92	3.106	12.5555	12.099
Saturday	28.7	766.3	1.2	0.7295	0 704
Total volume of gas 60° F. 30″ Hg					28.026

594 Following is a condensed record of each day's run with corrected volume readings:

During the second day run, two samples of gas were analyzed by means of Hempel apparatus. Fuming sulphuric acid was used for the absorption of the acetylene. One analysis gave 98.04 per cent, and the other 98.3 per cent of acetylene.

Recovery and Identification of Solvents.

For the recovery of the solvent from the acetylene tank the tank was laid in a hor-zontal position suitable for discharging into a deep metal tank. The discharge outlet was connected by means of a glass tube to a long condenser. The acetylene tank was then completely covered with water, which was heated by burners from below. The complete distillation of the solvent from the tank required a couple of days. All of the distillate from the tank was collected as one portion, and the final volume of this was 2,900 C. c. The following data relates to the solvent as distilled from the tank:

Specific Gravity	at 28.5° C.	0.8493
" "	" 15.5° C.	0.8580
Refractive Index	" 38.7° C.	1.3589

Two hundred and fifty cubic centimeters of the solvent were distilled through a five-chamber dephlegmating column and the redistilled liquid was collected in 25 c. c. portions. The following data applies to this distillation:

Fraction.	Boiling point.
1	56.6—57.3° C
2	57.7
3	57.8
4	57.8
5	58.4
6	58.5
7	58.8
8	67.0
9	98.5

There was left in the flask a small amount of undistilled residue. Fraction No. 9 was comprised of two liquid layers which were allowed to settle, the upper layer being withdrawn by a pipette. The boiling point of this material as determined in a small side-arm distillation flask was 165° C., and the refractive index at 37.4° C. was 1,3660. The odor of this product at once suggested turpentine, for which material the boiling point of 165° C. agrees. We determined the refractive index of commercial turpentine at 37.4° C. to be 1.3667, which leaves no question as to the identity of this Material.

595 We determined the refractive indexes for fractions Nos. 1, 3, 5, and 7, which agreed very closely with each other and averaged 1.3567 at 38.7° C. A sample of commercial acetone which

we had in the laboratory gave a refractive index of 1.3555 at this same temperature. The boiling point of the first seven fractions agrees closely with that of commercial acetone.

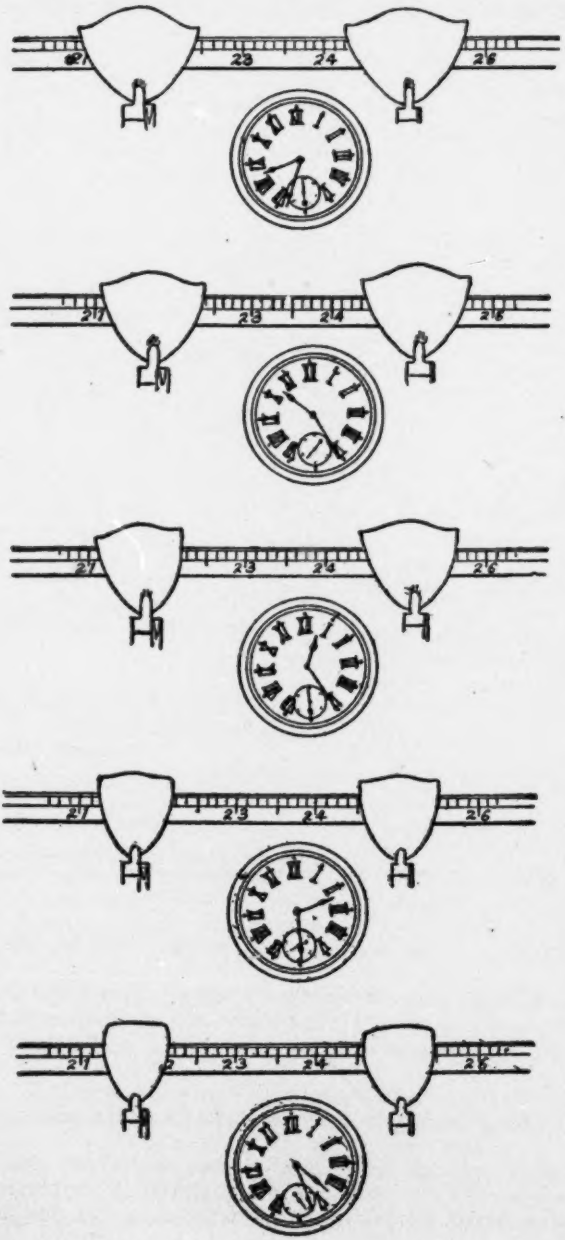
The specific gravity of fraction No. 3, which may be taken as representative of the main distillate, was 0.8001 at 15.5° C. The specific gravity of commercial acetone at a corresponding temperature was 0.7966.

The refractive index and specific gravity of the liquid distilled from the fireball tank are both slightly higher than the constants for ordinary commercial acetone. The increase in these constants is unquestionably due to the admixture of a small percentage of turpentine. From the calculations based upon the increase in the refractive index and specific gravity of the original distillate, we are led to believe that there is 5 or 10 per cent. of turpentine mixed in with acetone and that this is the solvent used in the fireball tank. In the course of the fractional distillation, we did not completely separate the turpentine from the acetone, recovering but 6 c.c. of fairly pure turpentine in the last fraction. The small amount of turpentine left in with the acetone causes the constants for the first fractions to be slightly higher than for commercial acetone.

Valve Control.

The following series of five photographs was taken two hours intervals between 8.34 A. M. and 4.27 P. M. on the first day of the discharge of gas from the firebal- tank.

596



597 In the following table are given the tank gauge pressures for times coincident with the taking of the various photographs.

Time.	Pounds.
8:30 A. M.	203
10:24 "	160
12:25 P. M.	134
2:30 "	115
4:28 "	101

For the purpose of establishing the time at which the different photographs were taken and to distinguish between the different prints, an open faced watch was set between the flames in such a way that it was well illuminated and shows distinctly in the pictures. The camera was set in position and focussed for the first photograph. The position of the camera was not disturbed during the remainder of the day. A comparison of the markings on the rule or of the watch-face indicates that the proper relation of the camera in regard to the flame was maintained throughout the day.

Despite the fact that the period of illumination was several hours longer than would usually be demanded in an acetylene lighting system, the reduction of pressure in the tank has not resulted in a very serious decrease in the illuminating power of the flame. The diminution in the size of the flame over a two-hours' discharge period is scarcely noticeable. From this it would therefore appear that the valve used on the fireball tank serves quite efficiently as a reducing valve and maintains a fairly uniform rate of discharge over a reasonable interval of time.

Respectfully submitted,

ARTHUR D. LITTLE, INC.,
F. E. GALLAGHER,
Research Chemist.

(*Hearing on Application for Injunction Deferred, Nov.* 3, 1911.)

Hearing on application for injunction deferred until Wednesday, November 15th, 1911.

(*Submission of Application for Injunction, Nov.* 15, 1911.)

Now at this day come the parties hereto by their respective solicitors, and argue and submit to the Court said complainants' application for an injunction herein.

598 (*Order Awarding Temporary Injunction, January* 22, 1912.)

This cause came on to be heard before this Court the — day of November 1911, on motion for a preliminary injunction, and after having heard counsel for both parties, and due consideration,

thereof being had, the Court finds the equities of the case to be with the complainants, and said motion for a preliminary injunction is granted.

It is therefore Ordered that upon complainants filing a bond herein in the sum of Fifteen Thousand ($15,000.00) Dollars, conditioned to abide the decision of this Court and Appellate Courts, and pay all moneys and costs which shall be adjudged against them in case this injunction may be dissolved, said bond to be approved by the Clerk of this Court on or before the 29th day of January 1912, the defendants herein, The Fireball Gas Tank and Illuminating Company and David L. Soloman, their officers, associates, attorneys, clerks, agents and workmen, and each of them, during the pendency of this action or until further order of this Court, be restrained from directly or indirectly, making, using, selling or otherwise disposing of and from offering to make, use or sell or otherwise dispose of, in any manner, any apparatus made according to or containing the invention described and claimed in United States Letters Patent No. 664,383, dated December 25, 1900, particularly claims 1, 2 and 5 thereof, described in the Bill of Complaint herein, and from directly or indirectly making, using, selling or otherwise disposing of and from offering to make, use, sell or otherwise dispose of, in any manner, the said Acetylene Gas Tank, known as the Fireball Gas Tank, and from in any way or manner, directly or indirectly, infringing upon or violating said Letters Patent, or inducing or assisting others to infringe upon or violate said Letters Patent.

Dated at Saint Louis, Missouri, on this 22nd day of January, A. D. 1912.

SMITH McPHERSON, *Judge.*

(Record Entry of Filing of Petition for Rehearing and Approval of Bond, January 22, 1912.)

Now come the said defendants by their solicitor and file a petition for rehearing on the motion of complainants for a temporary injunction in this cause. And come also the said complainants by their solicitors and present a bond upon such temporary injunction in the penal sum of Fifteen Thousand Dollars ($15,000) con-
599 ditioned as required by the order granting said temporary injunction, which said bond is now approved by the Clerk and filed.

Petition for Rehearing.

Filed in the District Court on Jan. 22, 1912.

Now come defendants in the above-entitled cause and petition for a rehearing of the motion for preliminary injunction and for ground of this petition respectfully show that Defendants' Exhibit No. 39, which is a certified copy of the file-wrapper and contents of the application for the patent in suit, shows that acetone was not mentioned in the application for the patent in suit at the time it

was filed, but was introduced thereinto by amendment several months later without a supplemental oath, the result being that the patent in suit issued without the essence of the invention being supported by an affidavit, as required by the statute.

The Supreme Court of the United States has recently decided that a patent issued under such circumstances is invalid. In this respect the case at bar is identical with the case of Steward v. American Lava Company, 215 U. S., 161, 54 L. Ed., 139, in which the Supreme Court of the United States decided that the amended specification of the Dolan patent, No. 589,342, for a duplex acetylene gas burner or tip of the Bunsen type, having a series of inclined air passage- in the sides, which, for the first time, if at all, indicates as the essence of the invention so short a chamber or cylinder as to prevent the mixing of the air taken into it, and to omit the current of gas surrounded by the greater part of such air as an envelope or film, is void under U. S. Rev. Stat. sec. 4892, U. S. Comp. Stat. 1901, p. 3384, because introducing entirely new matter not sworn to, where the original application made no claim for a process, and disclosed no invention of a device.

CHESTER H. KRUM,
HUGH K. WAGNER,
Solicitors and Counsel for Defendants.

Received a copy of this petition for rehearing this 22nd day of January, 1912.

FORDYCE, HOLLIDAY & WHITE,
Solicitors for Complainants.

(*Bond upon Temporary Injunction. Filed in the District Court on Jan. 22, 1912.*)

Know All Men By These Presents: That we, The Commercial Acetylene Company, a corporation organized under the laws
600 of the State of New Jersey, and The Prest-O-Lite Company, a corporation organized under the laws of the State of Indiana, as Principals, and the Massachusetts Bonding & Insurance Company, a corporation organized under the laws of the State of Massachusetts, as Surety, are held and firmly bound unto the Fireball Gas Tank & Illuminating Company, a corporation organized under the laws of the State of Missouri, and unto David L. Soloman, in the sum of Fifteen Thousand ($15,000.00) Dollars, for the payment of which well and truly to be made, we bind ourselves, our successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that:

Whereas, said Commercial Acetylene Company and said Prest-o-lite Company on the 22nd day of January, A. D. 1912, did obtain in the above entitled cause a preliminary injunction against said Fireball Gas Tank & Illuminating Company and David L. Soloman:

Now, if the said Commercial Acetylene Company and said Prest-o-lite Company shall well and truly pay all damages that may be

occasioned by said preliminary injunction and shall abide the decision which shall be made therein, and shall well and truly pay all sums of money, damages and costs that may be adjudged against them if the said preliminary injunction be dissolved, then the above obligation to be void, otherwise to be and remain in full force and virtue.

In Witness Whereof, the undersigned have caused these presents to be executed by their agents thereunto duly authorized, this 22nd day of Janary A. D. 1912.

THE COMMERCIAL ACETYLENE COMPANY,
By FORDYCE, HOLLIDAY & WHITE,
Its Solicitors and Agents.
THE PREST-O-LITE COMPANY,
By FORDYCE, HOLLIDAY & WHITE,
Its Solicitors and Agents.
MASSACHUSETTS BONDING & INSURANCE COMPANY,
By WILLIAM D. HEMENWAY,
Resident Vice-President.

Attest:
[SEAL.] JOSEPH P. MITCHELL,
Resident Assistant Secretary.

Approved January 22, 1912.

W. W. NALL, *Clerk.*

601 (*Answer to Defendants' Petition for Rehearing. Filed in the District Court on Jan'y* 29, 1912.)

Now comes complainants in the above entitled cause and for answer to defendants' petition herein for a rehearing of the motion for preliminary injunction respectfully shows that in the Patent Office of the United States were filed by Messrs. Claude & Hess two applications for letters patent *on* or about March 1897, one of which was for a patent for an apparatus or gas package and which ripened into the patent in suit, and the other of which was for a patent for a process of storing acetylene, etc., which application was abandoned.

Commercial Acetylene Co. v. Acme (188 Fed., 95).

The original specifications filed in the application for the apparatus patent (see defendants' Exhibit 39) contains cross-references to the application for the process patent, as follows:

"The present invention relates to an apparatus for the storage and distribution of acetylene *was* adapted to be used in accordance with the method described by us in another application filed herewith which method consists in forcing acetylene gas under pressure into a liquid which is a solvent thereof."

and again:

"Contained within the reservoir is a fluid *b* capable of dissolving

acetylene gas in accordance with the method set forth in our other application above referred to."

The words following the word "gas" in the quotation by amendment of September 17, '97 were elided and by amendment of July 9, '97 the words "such as alcohol or acetone" were inserted after the words "a fluid *b*."

The original specification was under oath.

The Method process referred to in the foregoing quotations contains as abundant references to the "essence of the invention" *that*, "alcohol and acetone" as even the captious and technical counsel for defendants would require.

The cross references to the method application quoted, under the practice in the patent office brought before the patent office under oath the "essence of the invention" as it was set forth in the companion application. And this it did just as effectually as if the words "such as alcohol or acetone" and other references to "acetone" were originally placed in the provisional specification under oath.

602 The references to acetone inserted after oath simply replaced and were a substitute for the quoted references to the process patent which were after [words] stricken out.

Complainants respectfully ask that the petition for rehearing be dismissed.

January 26, 1912.

WINTER & WINTER,
FORDYCE, HOLLIDAY AND WHITE,
Solicitors for Compl'ts.

Reply to Answer of Complainants to Defendants' Petition for Rehearing.

Filed in the District Court on Jan'y 31, 1912.

Complainants failed to serve a copy on defendants of complainants' answer to defendants' petition for rehearing, but from the journal of court proceedings entitled "Daily Record" we learned that such a document was filed by complainants, and, as it is fallacious and misleading, we deem it proper to make a brief reply.

We thought that complainants' counsel would fail sufficiently to understand the case before the court to discern that the oath to the method application would not support the package patent. What the statute requires is an affidavit for each application. No one could say that an affidavit that one has filed a companion application on the same date is equivalent to an oath that a certain thing is the invention of the applicant. Judge Quarles held that a package composed of the combination of a container and a supersaturated solution of acetylene gas dissolved in acetone is the essence of the patent in suit, its merits and patentability arising, as he said, from the supposed discovery by Claude & Hess of the especial s-ituability of acetone for this package. The affidavit to the method ap-

plication was not to the combination of the container and acetone and acetylene gas, but was merely for the supersaturation of acetone with acetylene gas.

The proceedings in the Patent Office showed that there was no invention in the supersaturation of acetone with acetylene gas as described in said method application, and the apparatus patent issued unsupported by an affidavit for the combination of the tank, acetone, acetylene gas, and a reducing valve.

Respectfully submitted,

HUGH WAGNER,
Solicitor for Defendants.

603 *Withdrawal of Petition for Rehearing.*

Filed in the District Court on Feb'y 3, 1912.

Defendants having on January 22, 1912, filed a petition for rehearing on the motion for preliminary injunction in this cause, but his honor, Judge Smith McPherson, having left St. Louis within an hour or two after signing the order granting a temporary injunction in this cause, whereby it was impossible for defendants to present said petition for rehearing to him for his action thereon prior to his leaving St. Louis, and his honor, Judge Smith McPherson not having returned to St. Louis up to the date of filing this document, whereby it has been impossible for defendants to submit said petition for rehearing to him, and defendants having desired during this delay and still desiring to take an appeal as promptly as possible from the order entered in this cause on Monday, January 22nd, 1912, granting a temporary injunction:

Now, therefore, for the reasons hereinbefore set forth, and in order that defendants may take said appeal, defendants hereby withdraw their said petition for rehearing.

HUGH K. WAGNER,
Solicitor for Defendants.

CHESTER H. KRUM,
HUGH K. WAGNER,
Of Counsel for Defendants.

(*Order Allowing Appeal and Granting Supersedeas, etc.*)

Now come the said defendants above named and present their assignments of error, which are now and here, with the consent of the court, and by order of the court, filed by the clerk herein.

And said defendants file their written petition for an appeal to the United States Circuit Court of Appeals for the Eighth Circuit from the order of January 22nd, 1912, allowing a temporary injunction in favor of complainants and against defendants herein which said appeal is in open court allowed, and a citation is issued duly signed.

And the said defendants ask that said appeal supersede said order of January 2nd, 1912. The same is granted and allowed. And said order appealed from will be and is superseded pending final decision on conditions following, viz:

1. Said defendants will give and file herein within ten days from this date a bond in the penalty of five thousand dollars, with surety, to be approved by this court, or a Judge thereof. Said bond
604 will be conditioned as by law provided, with the further conditions that defendants and neither of them will manufacture or sell any tanks complained of in the bill of complaint in this case.

And it is now and here ordered that pending said appeal, and final decision, that defendants and neither of them, will neither manufacture nor sell any tanks such — or like the tanks complained of in said bill of complaint in this case.

2. That said defendants will file with the Clerk of said Circuit Court of Appeals the full record on which said appeal is to be heard, on or before March 5th, 1912, and by March 15th, 1912, pay or secure to the satisfaction of said clerk the fees for filing and printing of the record.

3. That said defendants will file with said Clerk the brief and printed argument on appeal on or before March 25th, 1912;

4. This court reserves jurisdiction and the power to modify, enlarge or vacate the conditions as to the supersedeas herein.

Done in open Court this February 15th, 1912.

SMITH McPHERSON, *Judge.*

Assignment of Errors.

Now come the defendants, Fireball Gas Tank & Illuminating Company and David L. Soloman, by Chester H. Krum, Esq., and Hugh K. Wagner, Esq., their solicitors, and having simultaneously prayed an appeal to the United States Circuit Court of Appeals for the Eighth Circuit from the order of said District Court entered on the twenty-second day of January, 1912, granting a preliminary injunction against said defendants, respectfully represent as grounds of appeal and as an assignment of errors herein that said District Court erred in the following particulars, that is to say:

1. In granting said preliminary injunction.

2. In holding claims 1, 2, and 5 of United States letters-patent No. 664,383, dated December 25th, 1900, or any one of them valid.

3. In holding claims 1, 2, and 5 of United States letters-patent No. 664,383, dated December 25, 1900, to have been infringed by defendants or that any one of them has been so infringed.

4. In holding that Claude & Hess were the inventors of the subject matter of United States letters patent No. 664,383, dated December 25, 1900.

605 5. In not denying the motion for preliminary injunction on the ground that complainant's case as made by complainant's moving papers and rebuttal affidavits fails even prima

facie to show a right to a preliminary injunction by reason of the fact that said moving papers and rebuttal affidavits fail to show that the validity [or] complainant's patent had been at all sustained in prior litigation.

6. In not denying the preliminary injunction on the ground that complainants' case is not free from doubt as to the validity of the patent in suit.

7. In not denying the preliminary injunction on the ground that complainants' case is not free from doubt as to the infringement by the defendants of the patent in suit.

8. In not denying the preliminary injunction on the ground that complainant's case is not free from doubt as to the expiration of the patent in suit.

9. In not denying the injunction because complainants failed to show that irreparable injury to them would result unless the preliminary injunction were granted.

10. In not denying the preliminary injunction on the ground the complainants had been guilty of laches in filing the suit so as to deprive them of the right to preliminary injunction.

11. In not holding that complainants had been guilty of laches in applying for the preliminary injunction so as to deprive them of the right to such relief.

12. In not holding that, upon proper consideration of the balance of convenience between complainants and defendants it appears that the preliminary injunction should have been denied because more harm results to defendants by the granting thereof than would have been incurred by complainants if it had been refused complainants.

13. In granting a preliminary injunction after answers fully denying the alleged equities of the bill had been filed.

14. In applying to this case the doctrine of comity notwithstanding the fact that many of the most important defenses pleaded and proved on behalf of defendants in the case at bar had not been even raised in any suit filed under the patent in suit against any one else.

15. In not holding that the patent in suit is limited to the use of either alcohol or acetone as the solvent for acetylene gas and
606 is not infringed by the use by defendant Fireball Gas Tank & Illuminating Company of a solvent other than alcohol or acetone.

16. In holding that defendant's tank does not infringe complainant's patent because the outlet for the gas in defendant's tank is located above the level of the solvent.

17. In not holding that defendant's tank does not infringe complainant's patent because defendant's tank is provided with a needle valve and not with a reducing-valve and that complainants' patent is limited to a reducing-valve.

18. In granting a preliminary injunction against David L. Soloman as an individual notwithstanding the fact that there are in the record neither allegata nor probata to charge him as an individual with alleged infringement of complainants' patent and notwithstanding the fact that his individual answer pleads and the uncon-

tradicted evidence shows that his acts relative to the subject-matter of this suit have been exclusively performed as an officer and employee of the corporate defendant Fireball Gas Tank & Illuminating Company.

19. In not holding that because of the failure to pay taxes on June 30, 1900, on the Claude & Hess British patent No. 29,750 of 1896, whereby said British patent lapsed on said date, the patent in suit was wholly invalid from the date of its issue on December 25th, 1900.

20. In not holding that claims 1, 2, and 5, of complainants' patent in suit were anticipated by the prior art.

21. In not holding that a court of equity was without jurisdiction at the time the suit was filed to retain the bill of complaint due to the fact that the patent had expired prior to the filing of the suit.

22. In not holding that a court of equity could not issue an injunction subsequent to August 26th, 1911, by reason of the expiration of the patent in suit at midnight on August 26, 1911 by reason of the simultaneous expiration of the German patent to Claude & Hess No. 97,953.

23. In not holding that German patent No. 97,953 having expired on August 26, 1911, and the United States patent in suit simultaneously therewith and complainants' bill of complaint having been dismissed from a court of equity on Tuesday following the first Monday in October, 1911, the Court below had not authority to resume jurisdiction as a court of equity after said expiration of said patent in suit of said Cause.

607 24. In not holding that the subject-matter of the patent in suit is identical with that of the German Patent No. 97,953 to the same patentees.

25. In not holding that the French patent No. 257,679 to Claude & Hess is for the same subject-matter as that of the Claude & Hess patent in suit.

26. In not holding that the patents of addition of June 11, 1897, and April 26, 1898, to said French patent to Claude & Hess No. 257,679 are each, respectively, for the same subject matter as that of the patent in suit.

27. In not holding that the subject matter of British patent to Claude & Hess No. 29,750 of June 30, 1896, is the same as that of the patent in suit.

28. In not holding that the patent in suit expired not later than the date of expiration of said British patent No. 29,750 of 1896.

29. In not holding that the patent in suit expired not later than the date of expiration of said French patent No. 257,679.

30. In not holding that the patent in suit expired not later than the date of expiration of said German patent No. 97,953.

31. In entering its order of October 27, 1911, refusing to strike the affidavits of Theodore du Moulin and Oramel H. Skinner from the file because sworn to before the suit was filed and because said affidavit of Theodore du Moulin is not entitled in the cause and because said affidavit of Oramel H. Skinner was entitled in this cause at a time when there was no lis pendens.

32. In entering its order of October 27, 1911, granting complainants leave to file four rebuttal affidavits.

33. In holding that the patent in suit is valid notwithstanding the fact that the application for the patent in suit did not as filed contain any mention of either acetone or alcohol, said solvents having been introduced for the first time into the specification of the patent in suit by an amendment filed in July, 1897, with a supplemental oath, whereby the patent issued with its essence unsworn to, contrary to section 4892 of the Revised Statutes of the United States.

Wherefore, the defendants pray that the said order be reversed.

HUGH K. WAGNER,
Solicitor for Defendants.

CHESTER H. KRUM,
HUGH K. WAGNER,
Of Counsel for Defendants.

Filed, February 15, 1912. W. W. Nall, Clerk.

608 *Petition for Appeal.*

The above-named defendants, conceiving themselves aggrieved by the order made and entered on the twenty-second day of January, 1912, granting preliminary injunction in this cause do hereby appeal from said order to the United States Circuit Court of appeals for the Eighth Circuit for the reasons specified in the assignment of errors which is filed herewith, and they severally pray that this appeal may be allowed and that the transcript of the record, proceedings, papers and exhibits upon which said order was made, duly authenticated, may be sent to the United States Circuit Court of Appeals for the Eighth Circuit. It is furthermore prayed that the physical exhibits be likewise transmitted by the clerk of this court to the clerk of the United States Circuit Court of Appeals for the Eighth Circuit.

Said defendants furthermore pray this court to grant a stay of the preliminary injunction in this cause pending the decision of said appeal on condition that defendant take the steps necessary to perfect said appeal in time for said appeal to be placed on the docket of the May term of the said United States Circuit Court of Appeals for the Eighth Circuit.

Dated this — day of January, 1912.

(Signed) HUGH K. WAGNER,
Solicitor for Defendants.

CHESTER H. KRUM,
HUGH K. WAGNER,
Of Counsel for Defendants.

Filed February 15th, 1912. W. W. Nall, Clerk.

(*Appeal Bond.*)

Know all Men by these Presents, That we, Fireball Gas Tank & Illuminating Company and David L. Soloman as Principal, and National Surety Company, as surety, are held and firmly bound unto Commercial Acetylene Company and the Prest-O-Lite Company in full and just sum of Five Thousand — ($5,000.00) to be paid to the said Commercial Acetylene Company and the Prest-O-Lite Company, their successors or assigns; to which payment well and truly to be made, we bind ourselves, our heirs, executors, and administrators, jointly and severally by these presents. Sealed with our seal-, and dated this 15th day of February, in the year of our Lord one thousand nine hundred and twelve.

609 Whereas, lately at the January Term A. D. 1912, of the District Court of the United States for the Eastern Division of the Eastern Judicial District of Missouri, in a suit depending in said Court between Commercial Acetylene Company and The Prest-O-Lite Company, Complainants, and Fireball Gas Tank & Illuminating Company and David L. Soloman, was rendered against the said Fireball Gas Tank & Illuminating Company and David L. Soloman and the said Fireball Gas Tank & Illuminating Company and David L. Soloman have [obtain- and] appeal from the said Court to reverse the order in the aforesaid suit and a citation directed to the said Commercial Acetylene Company and the Prest-O-Lite Company citing and admonishing complainants to be and appear in the United States Circuit Court of Appeals, for the Eighth Circuit, at the City of St. Louis, Missouri, sixty days from and after the date of said citation.

Now the Condition of the Above Obligation is such, That if the said Fireball Gas Tank & Illuminating Company and David L. Soloman shall prosecute said appeal to effect, and answer all damages and costs if they fail to make good their appeal, and will not manufacture or sell any tanks complained of in the bill of complaint herein, then the above obligation to be void, else to remain in full force and virtue.

Sealed and delivered in presence of

[SEAL.]

FIREBALL GAS TANK & ILL. CO., [SEAL.]
By DAVID L. SOLOMON, *Pres.*
DAVID L. SOLOMON. [SEAL.]
NATIONAL SURETY COMPANY, [SEAL.]
By ARTHUR W. RANKIN,
Attorney-in-Fact.

Approved by
SMITH McPHERSON, *Judge.*

Filed February 15th, 1912. W. W. Nall, Clerk.

Præcipe for Transcript.

Filed in the District Court on Feb'y 16, 1912.

To the Clerk of the United States District Court in and for the Eastern Division of the Eastern Judicial District of Missouri:

You are requested to make a transcript of record to be filed in the United States Circuit Court of Appeals for the Eighth Circuit, pursuant to an appeal allowed the same date this præcipe is filed with you in the above-entitled cause from the order entered January 22, 1912, granting a temporary injunction, and to include in such transcript of record the following and no other papers or exhibits, to-wit:

610

1. Complainants' bill of complaint and date of filing same;
2. Complainants' replications and date of filing same;
3. Complainants' motion for preliminary injunction and date of filing same and all complainants' moving affidavits, namely those of Theodore du Moulin, Theodore W. Smith, and Oramel H. Skinner, and the date of filing same, and all complainants' rebuttal affidavits, namely those of Frederick W. Russe, Oramel H. Skinner, Theodore W. Smith, and Francis E. Gallagher and the exhibit attached to said affidavit of Francis E. Gallagher, and the date of filing said affidavits;
4. The rule to show cause why preliminary injunction should not issue.
5. All documents and exhibits contained in defendants' printed record, and the date of filing said individual affidavits and documents.
6. Affidavits on behalf of defendants of William B. Potter dated October 23, 1911, of Dr. Herman H. Born dated October 19, 1911, of Clarence De Witt Lukens dated October 23, 1911, and exhibits attached thereto, and affidavits of Joseph S. Soloman dated October 23, 1911, and exhibits attached thereto, and the date of filing each of said affidavits.
7. All documentary exhibits named in the list of exhibits forming part of the index to defendants' printed record.
8. Defendants' motion to strike from the files the affidavits of Theodore du Moulin and Oramel H. Skinner, and order overruling same.
9. Order of October 27, 1911, allowing complainants to file four affidavits in rebuttal.
10. Order, cause submitted, November 15, 1911.
11. The order granting the temporary injunction and opinion of the court, if any; complainants' bond on same.
12. Defendants' petition for rehearing and complainants' answer thereto and defendants' reply to said answer and defendants' withdrawal of said petition, and the dates of filing each.
13. The petition for appeal and assignment of errors filed therewith and order allowing said appeal and making order as to exhibits, etc.

14. Appeal bond.
15. This præcipe for transcript.
16. Citation on appeal.

611 17. Your certificate that said transcript is a complete transcript of the entire record in said cause on which said order from which this appeal is taken was made.

Respectfully,

HUGH K. WAGNER,
Solicitor for Defendants.

(*Clerk's Certificate.*)

I, W. W. Nall, Clerk of the District Court of the United States in and for the Eastern Division of the Eastern Judicial District of Missouri, do hereby certify that the foregoing is a full, true and complete transcript of the record and proceedings in the cause therein entitled, save as restricted by the præcipe for transcript therein set forth, as fully as the same remains on file and of record in said cause in my office; and that the original Citation is hereto attached and herewith returned.

In Witness Whereof I hereunto set my hand and affix the seal of said District Court at office in the City of St. Louis, in said Division of said District, this fourth day of March A. D. 1912.

[Seal U. S. District Court, Eastern Division, Missouri.]

W. W. NALL,
Clerk of said Court.

Filed Mar. 5, 1912. John D. Jordan, Clerk.

612 (*Appearance of Counsel for Appellants.*)

On the sixth day of March, A. D. 1912, the appearance of counsel for appellants was filed in said cause, in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit.

No. 3745.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN, Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Appellees.

The Clerk will enter my appearance as Counsel for the Appellants.

HUGH K. WAGNER,
503 *Fullerton Building, St. Louis, Missouri.*

(Endorsed:) U. S. Circuit Court of Appeals, Eighth Circuit. No. 3745. Fireball Gas Tank & Illuminating Company and David Leon Soloman, Appellants, vs. Commercial Acetylene Company and The Prest-O-Lite Company, Appellees. Appearance. Filed Mar. 6, 1912. John D. Jordan, Clerk. Hugh K. Wagner, Counsel for Appellants.

(*Appearance of Counsel for Appellees.*)

And on the first day of April, A. D. 1912, the appearance of counsel for the appellees was filed in said cause, in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit.

No. 3745.

FIREBALL GAS TANK AND ILLUMINATING COMPANY and DAVID L. SOLOMAN, Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY.

The Clerk will enter *my* appearance as Counsel for the Appellees.

613

CLARENCE WINTER.
KEYES WINTER.
JOHN P. BARTLETT.
S. W. FORDYCE, JR.
JOHN H. HOLLIDAY.
T. W. WHITE.

(Endorsed:) U. S. Circuit Court of Appeals, Eighth Circuit. No. 3745. Fireball Gas Tank and Illuminating Company, et al., Appellants, vs. Commercial Acetylene Company, et al. Appearance. Filed Apr. 1, 1912. John D. Jordan, Clerk. Clarence Winter, Keyes Winter, John P. Bartlett, S. W. Fordyce, Jr., John H. Holliday, T. W. White, Counsel for Appellees.

(*Order of Argument.*)

And on the ninth day of May, A. D. 1912, in the record of the proceedings of said Circuit Court of Appeals is an order of argument in said cause, in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit, May Term, 1912, Thursday, May 9, 1912.

No. 3745.

FIRE BALL GAS TANK AND ILLUMINATING COMPANY et al., Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY et al.

Appeal from the District Court of the United States for the Eastern District of Missouri.

This cause having been called for hearing in its regular order, argument was commenced by Mr. Hugh K. Wagner for appellants, and the hour for adjournment having arrived further argument is postponed until tomorrow.

(*Order of Submission.*)

And on the tenth day of May, A. D. 1912, in the record of the proceedings of said Circuit Court of Appeals is an order of submission in said cause, in the words and figures following, to-wit:

614 United States Circuit Court of Appeals, Eighth Circuit, May Term, 1912, Friday, May 10, 1912.

No. 3745.

FIRE BALL GAS TANK AND ILLUMINATING COMPANY et al., Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY et al.

Appeal from the District Court of the United States for the Eastern District of Missouri.

This cause having been called for further hearing, argument was continued by Mr. Hugh K. Wagner for appellants, by Mr. Keyes Winter and Mr. John P. Bartlett for appellees and concluded by Mr. Hugh K. Wagner for appellants.

Thereupon, this cause was submitted to the Court on the transcript of record from said District Court and the briefs of counsel filed herein.

(*Opinion.*)

And on the second day of September, A. D. 1912, the opinion of the United States Circuit Court of Appeals for the Eighth Circuit was filed in said cause, in the words and figures following, to-wit:

615 United States Circuit Court of Appeals, Eighth Circuit, September Term, A. D. 1912.

No. 3745.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Appellants,
vs.
COMMERCIAL ACEYLENE COMPANY et al., Appellees.

Appeal from the District Court of the United States for the Eastern District of Missouri.

Mr. Hugh K. Wagner, appeared for appellants.

Mr. Keyes Winter and Mr. John P. Bartlett (Mr. Clarence Winter and Mr. John H. Holliday, were with them on the briefs) for the appellees.

Before Sanborn and Hook, Circuit Judges, and Willard, District Judge.

Syllabus.

1. Injunction—Appeal and Error—Interlocutory Injunctions—Discretion of Trial Court—Clear Proof of Abuse of Discretion Requisite to Dissolve.

Granting or refusing a temporary injunction is entrusted to the discretion of the court of original jurisdiction, not to the discretion of the appellate court.

In the absence of a violation of the rules and principles of equity established for the guidance of the court of original jurisdiction, the action of that court in granting or refusing such an injunction must be sustained, unless there is clear proof of abuse of its discretion.

2. Patents—Preliminary Injunction—Effect of Prior Decisions.

When there has been a prior adjudication sustaining a patent and the infringement thereof, in the same or in another circuit, where its validity was contested on full
616 proofs, a circuit court should, on motion for preliminary injunction, sustain the patent and leave the determination of its validity until after the final hearing.

3. Same—Appeal from Preliminary Injunction—Disputed Issues of Fact Reserved Until Final Hearing.

Where questions of fact and of mixed law and fact are presented to the appellate court on an appeal from the court below which has issued an injunction upon a prior adjudication of the validity and infringement of the patent, this court will not consider and determine these questions, but will reserve their decision until after the final hearing upon the issues they present below. The facts recited upon which this ruling is founded.

SANBORN, *Circuit Judge*, delivered the opinion of the court.

This is an appeal from an order which granted an interlocutory injunction against the infringement by the defendant below of Claims 1, 2 and 5 of Letters Patent, No. 664,383, issued to Claude & Hess on December 25, 1900, for a combination of elements which constituted an apparatus for storing and distributing acetylene gas. The thing sought by the inventors was an apparatus by means of which acetylene gas, which in its normal state is inflammable and explosive, could be safely enclosed, stored, and if desired, transported in a reservoir or tank to the place where it was to be used and there slowly discharged through many hours, to produce light and heat. To attain this end Claude & Hess placed in a steel tank or closed reservoir, provided with an inlet through which it could be charged and an outlet through which it could be discharged, and with suitable valves in these openings to open and close them, a liquid solvent, such as acetone or alcohol and acetylene gas forced into this liquid in the reservoir and confined there under a pressure of about 12 atmospheres. Under these circumstances acetone absorbed 300 times its volume of acetylene gas and while acetone and acetylene gas were both normally inflammable and explosive the supersaturated solution produced and stored in the way described in the specification of this patent was neither inflammable nor explosive and could be safely and conveniently stored, transported in and used from the reservoirs. The apparatus immediately went into general use. Suitable tanks containing such a supersaturated solution for the purpose of furnishing light for automobiles were manufactured and used and when the gas was exhausted from them they were charged and used again and again as often as desired. The complainants are corporations which have succeeded to the rights of Claude & Hess. Under their patent they have been manufacturing and selling an apparatus of this character for the purpose of furnishing light for automobiles, which is called the "Prest-o-lite" tank. The defendants were manufacturing and selling such an apparatus called the "Fireball" tank, which is claimed to be an infringement of the patent in suit.

617 In their specification for this patent Claude & Hess wrote, "The apparatus is to be charged or prepared at a central station or distributing point and shipped or transported to the intended place of use as a complete article or package adapted to be placed in communication with the burners or pipes of a building, room or space to be lighted. * * * Contained within the reservoir is a fluid, such as alcohol or acetone, capable of dissolving acetylene gas. * * * In order that the gas delivered from the receptacle may pass into the pipes to the burner under a substantially uniform pressure (the pressure of the gas within the reservoir of course decreasing as the gas passes out therefrom), a reducing valve *d*, of any suitable or usual construction, is interposed between the interior of the receptacle and the outlet *c* therefrom. * * * It is not intended to limit the invention to the specific construction herein shown, since modifications may obviously be made." The first claim of the patent is, "1. A closed vessel containing a super-

saturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet, whereby gas may escape therethrough at substantially uniform pressure, substantially as described." The second claim secures "A prepared package consisting of" * * * "a reducing valve" and the other elements of the apparatus and the fifth claim secures "as a new article of manufacture, a gas package comprising" acetone as the liquid solvent, the reducing valve and the other elements of the combination.

An order to show cause why the preliminary injunction should not issue was made on October 16, 1911. It was followed by an answer, affidavits, counter-affidavits, patents and publications, which fill more than five hundred printed pages of the record before us. The application for the injunction was argued and submitted to the court on these voluminous proofs upon November 15, 1911, and on January 22, 1912, the order for the injunction was made.

The granting or withholding of an interlocutory injunction rests in the sound judicial discretion of the court of original jurisdiction and where that court has not departed from the equitable rules and principles established for its guidance, its orders in this regard may not be reversed by the appellate court without clear proof that it has abused its discretion. An appeal from such an order does not invoke the judicial discretion of the appellate court. The question is not whether or not the appellate court would have made or would make the order. It is to the discretion of the trial court, not to that of the appellate court, that the law has entrusted the granting or refusing of such an injunction and the question here is, does the proof clearly establish an abuse of that discretion by the court below? Massie v. Buck, 128 Fed. 27, 31, 62 C. C. A. 535, 539; Love v. Atchison, T. & S. F. Ry. Co., 185 Fed. 321, 618 330; High on Injunctions, 4th Ed., Sec. 1696; Higginson v. Chicago, B. & Q. R. R. Co., 102 Fed. 197, 199, 42 C. C. A. 254, 256; Interurban Ry. & Terminal Co. v. Westinghouse E. & Mfg. Co., 186 Fed. 166, 170, 108 C. C. A. 298, 302; Kerr v. City of New Orleans, 61 C. C. A. 450, 454, 126 Fed. 920, 924; Thompson v. Nelson, 18 C. C. A. 137, 138, 71 Fed. 339, 340; Societe Anonyme Due Filtre Chamberland Sys. Pasteur v. Allen, 33 C. C. A. 282, 285, 90 Fed. 815, 818; Murray v. Bender, 48 C. C. A. 555, 559, 109 Fed. 585, 589; U. S. Gramophone Co. v. Seaman, 51 C. C. A. 419, 423, 113 Fed. 747, 749.

At the close of his brief in this case counsel for the defendants below summarizes his contentions into seven reasons why this question should be answered in the affirmative. Four of them are that the prior state of the art discloses the fact that the patent is void for lack of novelty and that it expired with the expiration of certain foreign patents which he claims were for the same apparatus as that secured by the domestic patent, and three of them are that the defendants escape infringement, although their apparatus is literally described by the first claim of the patent to Claude &

Hess, because they use a needle valve in the outlet of their tank in place of the specific reducing valve described in the specification of Claude & Hess, because they use terpeline as the liquid solvent instead of the acetone used by the complainants and because the outlet of their tank is not located above the level of the liquid solvent where the specification of Claude & Hess places theirs.

It is an incontrovertible rule of equity jurisprudence that where there has been a prior adjudication sustaining a patent and an infringement thereof in the same or another circuit, where the validity of the patent has been contested on full proofs, the circuit court should, upon a motion for a preliminary injunction, sustain the patent and leave the question of its validity to be determined upon the final hearing. Leeds & Catlin Co. v. Victor Talking Machine Co., 213 U. S. 301, 312; Interurban Ry. & Terminal Co. v. Westinghouse E. & Mfg. Co., 186 Fed. 166, 170.

On January 22, 1912, when the court below made the order for the injunction the validity of this patent had been contested on full proofs, had been sustained on final hearing and its infringement by the use of a tank in which a needle valve had been substituted for the reducing valve described in the specification of Claude & Hess had been adjudged on January 13, 1909. Commercial Acetylene Co. v. Avery Portable L. Co., 166 Fed. 907, 910-912, 913-915. Counsel argues that the fact which appears in this case, but was not proved in that case, that Claude & Hess knew in June, 1897, that Berthelot & Vielle had discovered "that the dissolution of acetylene in acetone under a pressure which is not very much over 10 atmospheres cannot explode, that only is explosive the space above the liquid which is filled with acetylene gas" takes this case out of this rule. It is, however, claimed by
the complainants that the discovery here mentioned was not
619 the invention secured by this patent, but that that invention
was the combination of the tank, the liquid solvent in the tank, the acetylene forced into and secured in the tank and the inlet and outlet so made and provided with valves that the tank could be conveniently charged, that the charged package could be safely and conveniently transported and that the acetylene therein could be discharged with a low and uniform pressure wherever desired. Counsel made other less important claims of new evidence of the prior art. But in view of the prior adjudication it cannot be held that it was any abuse of discretion in the court below to reserve the final decision of these claims until the hearing of the case upon the merits.

The claim of counsel for the defendants that the patent had expired was based on the British Patent to Claude & Hess No. 29,750, issued June 30, 1896, which expired June 30, 1910, and upon the German patent to Claude & Hess, issued August 27, 1896, which expired August 27, 1911, and upon the provision of Section 4887 of the Revised Statutes, U. S. Comp. Stat. 1901, page 3382, that every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time as the foreign patent. The defendants claimed, as other

defendants had claimed before, that these foreign patents were for the apparatus secured by the domestic patent in suit, and hence that they limited its life, while the complainants insisted that they were patents for the process used by Claude & Hess and not for their combination or apparatus and that they did not affect the domestic patent for the latter. The Supreme Court had decided that "A process and an apparatus by which it is performed, are distinct things. They may be found in one patent; they may be made the subject of different patents. So may other dependent and related inventions. If patented separately a foreign patent for either would not affect the other." Leeds & Catlin Co. v. Victor Talking Machine Co., 213 U. S. 301, 318. The Circuit Court of Appeals of the Sixth Circuit had cited and followed that decision in Acme Acetylene Appliance Co. v. Commercial Acetylene Co., 192 Fed. 321, 326, 112 C. C. A. 573, 578, and in Century Electric Co. v. Westinghouse Electric & Mfg. Co., 191 Fed. 350, 359, 360, 112 C. C. A. 8, 17, 18, this court had held that a patent for a process which described the machine and a patent for the only known machine by which the process could be practiced, which described the process, were patents for separate inventions and neither was affected by the other. The terms of the British patent lent themselves more strongly than those of the German patent to the argument that it was for an apparatus and on April 25, 1911, Circuit Judge Kohlsaat, on an application for a preliminary injunction so held, a conclusion to which he has adhered on the final decision of that case in an opinion handed down on June 26, 1912, six months after the court below made its order. Commercial Acetylene Co. v. Searchlight Gas Co., 188 Fed.
620 35. But Judge Denison, on April 26, 1911, had filed an opinion in which he had reached the opposite conclusion and upon a motion for a re-hearing, upon which Judge Kohlsaat's opinion was urged upon his attention, he considered it and declared that notwithstanding he was satisfied that his own opinion was correct. Commercial Acetylene Co. v. Acme Acetylene Appliance Co., 188 Fed. 89, 91. An appeal had been taken from the order of Judge Denison to the Circuit Court of Appeals of the Sixth Circuit. The opinions of Judge Kohlsaat and Judge Denison had been urged in support of the respective contentions of the parties in that court and on December 5, 1911, it had delivered a considered and unanimous opinion that the British patent was for a process and not for an apparatus, that it was not for the same invention as the patent in suit and that it did not limit its terms. Acme Acetylene Appliance Co. v. Commercial Acetylene Co., 192 Fed. 321, 326, 112 C. C. A. 573, 578. Such was the state of the adjudications upon this subject when the court below was required to determine whether or not it would refuse an injunction because the domestic patent had expired. There had been, it is true, no adjudication of the character of the German patent, but its terms are much less favorable to the contention that it is a patent for an apparatus than are those of the British patent. The specification mentions the "present process" five times, describes it, describes two apparatus, gives figures of them and closes with these words: "Indeed, the apparatus described above

and shown in Figures 1 and 2, are only given by way of example for explaining the process and the latter is independent of the described constructional forms." The German patent has but one claim, and that reads in this way: "The employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating and the like, characterized by the acetylene being absorbed under pressure by a suitable liquid saturated with acetylene being preserved or contained in suitable vessels from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed." It is the claims of a patent, not the narratives or descriptions in the specifications that portray, define and limit the invention that is patented. Leeds & Catlin Co. v. Victor Talking Machine Co., 213 U. S. 301, 315; Railroad Company v. Mellon, 104 U. S. 112, 118; Keystone Bridge Co. v. Phœnix Iron Co., 95 U. S. 274, 279. The court below was favored with the affidavits of experts and the arguments of counsel relative to the nature of the invention patented by the German patent, relative to the state of the prior art, relative to the validity and expiration of the patent in suit and relative to its infringement by the defendants. In Victor Talking Machine Co. v. Talk-o-phone Co., 146 Fed. 534, claims 5 and 35, of Berliner patent, No. 534,543, had been sustained and adjudged infringed in 140 Fed. 860. In that subsequent suit against another defendant an application for a preliminary injunction was made and over 500 pages of affidavits and briefs were
621 presented to the Circuit Court upon the hearing of the application. Twelve defenses, claimed to consist of new matter not before the court on the former hearing, or to relate to matters which were not then discussed or considered, were presented. Some of these defenses consisted of new matter discovered in the prior art, some were that the patent had expired because prior foreign patents for the same invention had expired, some were that the defendant had not infringed and that the complainant was guilty of laches. The Circuit Court considered some of these defenses, deferred consideration of laches, non-infringement and some others, expressed the opinion that no new matter had been introduced which would in his judgment have led the court which made the prior adjudication to reach a different conclusion from that which it had announced, and added: "But, even if I am mistaken in this view, and if the expiration of the Suess Canadian patent is a complete defense, or if a decision of the questions raised as to the character and scope of the various patents, now introduced for the first time, should be postponed until final hearing, yet I am constrained to grant the injunction in order to permit an appeal and a determination of the questions at the earliest possible moment." Thereupon the court ordered the issue of the interlocutory injunction. An appeal from this order was taken and it was affirmed by the Circuit Court of Appeals of the Second Circuit in open court without an opinion. Victor Talking Machine Co. v. Leeds & Catlin Co., 148 Fed. 1022. The case was then taken to the Supreme Court by writ of certiorari. In its opinion that court noticed the fact that the Circuit Court had not passed upon the question of infringement, set forth the quota-

tion from its opinion made above, recited that the lower courts had also reserved, until the hearing on the merits, the consideration of the defense that the claims in suit were void because they were for functions of machines and not for the machines themselves, and then said: "In passing on the foreign patents the circuit court considered that the prior adjudications fortified the presumption of the validity of the patent in suit, and established its scope, and that the new matter introduced did not repel the presumption, or limit the extent of the patent. That the lower courts properly regarded the prior adjudication as a ground of preliminary injunction is established by the cases cited in Walker on Patents, Sec. 655, et seq. See also Robinson on Patents, Sec. 177, et seq. And in that aspect the question must be considered, and so considering it we may pass the defenses of anticipation, whether complete or partial, and the defense of infringement." Leeds & Catlin Co. v. Victor Talking Machine Co., 213 U. S. 301, 311, 312. Passing then the defenses of anticipation and infringement in the case in hand, as we well may under the decisions of the Supreme Court and the Circuit Court of Appeals of the Sixth Circuit in the Leeds & Catlin case, and under the other decisions which have been cited to the same effect, and bearing in mind the facts that on January 22, 1912, the validity of the
622 patent and its scope, that it was not anticipated in the prior art and that the use of a needle valve in place of the specific reducing valve described in the patent did not avoid infringement, had been adjudicated in the year 1909, after full and final hearing, that two chancellors had reached opposite conclusions on the question whether or not the apparatus secured by the domestic patent had been patented by the British patent, that the Circuit Court of Appeals of the Sixth Circuit, after a consideration of the opinions of both these judges, had delivered an unanimous opinion that it was not so patented, that the terms and claim of the German patent were more favorable to a like decision regarding that patent than were those of the British patent, there is no rational or logical escape from the conclusion that the evidence in this record falls far short of clearly or preponderantly showing that the court below was guilty of an abuse of discretion in its issue of the interlocutory injunction.

The claim of the defendants in this case that they do not infringe because they use terpeline instead of acetone, which claim is conditioned by conflicting testimony and by the counterclaim that the patent is not limited to the use of acetone or alcohol, and that they do not infringe because they place the outlet of their tank below the level of the liquid solvent, a claim that is conditioned by explanatory evidence, the claim that the [illegible] is void because an amendment to the specification was not [illegible]anied with the oath required by Rule 48 of the Patent Office, when the theory of an invention and the mode of applying it is first introduced by the amendment, Steward v. American Lava Co., 215 U. S. 161, which is met by the claim that the amendment in question had no such effect, the claim that some of the affidavits were not competent and the other claims of the defendants in this case, have been considered before reach-

ing this conclusion, although some of them have not been discussed in this opinion. But what has been already said is equally applicable to each of these, and there is nothing in this case to sustain the theory that the court below abused its discretion in the issue of the injunction.

Counsel for the defendants invites the court to consider and determine the equities of this entire case and to dismiss the bill, as did the Supreme Court in Mast Foos & Co. v. Stover Mfg. Co., 177 U. S. 485, 495. But the suit in hand is more analogous to the Leeds & Catlin case, 213 U. S. 311, in which the Supreme Court denied a like prayer with the remark, "If we should yield to this invocation and attempt a final decision, it would be difficult to say whether it would be more unjust to petitioner or to respondent." The decisions of many of the questions the defendants present must be determined by the consideration of conflicting testimony, many of the questions they raise are questions of mixed law and fact, the just determination of which may be much aided by the testimony of witnesses, the interests involved here are large and in the
623 condition of the litigation concerning this patent, the ends of justice would be better and more certainly attained by reserving, and we do hereby reserve, our opinion upon all the questions it presents, except the question of the abuse by the court below of its discretion in the issue of the injunction, until the affidavit stage of this proceeding shall have been passed, until the rights of these parties shall have been tested by the production, hearing and cross-examination of their witnesses according to the salutary and searching practice of the common law, and until the court below, at the final hearing, has investigated and decided the issues these parties raise in the light of that testimony and of the argument of counsel. The order for the injunction must accordingly be Affirmed, and it is so ordered.

HOOK, *Circuit Judge:*

This case is exceptionally circumstanced. I concur in the result for the reasons mentioned in the last paragraph of the opinion.

Filed September 2, 1912.

624 (*Decree.*)

And on the second day of September, A. D. 1912, in the record of the proceedings of said Circuit Court of Appeals is a decree in said cause, in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit, September Term, 1912.

MONDAY, September 2, 1912.

No. 3745.

FIREBALL GAS TANK AND ILLUMINATING COMPANY and DAVID L. SOLOMAN, Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY.

Appeal from the District Court of the United States for the Eastern District of Missouri.

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Eastern District of Missouri, and was argued by counsel.

On Consideration Whereof, it is now here ordered, adjudged and decreed by this Court, that the decree of the said District Court, in this cause, granting an injunction herein, be, and the same is hereby, affirmed with costs; and that the Commercial Acetylene Company and The Prest-O-Lite Company have and recover against the Fire Ball Gas Tank and Illuminating Company and David L. Soloman the sum of twenty dollars for their costs herein and have execution therefor.

September 2, 1912.

(*Petition of Appellants for a Rehearing.*)

And on the thirtieth day of October, A. D. 1912, a petition of the appellants for a rehearing was filed in said cause, in the words and figures following, to-wit:

625 In the United States Circuit Court of Appeals for the Eighth Circuit.

In Equity. No. 3745.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Appellees.

Petition for Rehearing.

Now come Fireball Gas Tank & Illuminating Company and David Leon Soloman, the appellants in the above-entitled cause, and petition for a rehearing thereof, and for grounds of said petition respectfully state the following reasons:

I.

The Patent in Suit Has Never Been Adjudicated as Valid on Fu
Proofs.

In its opinion, this honorable court says:

"It is an incontrovertible rule of equity jurisprudence that whe
there has been a prior adjudication sustaining a patent and an i
fringement thereof in the same or another circuit, where the validi
of the patent has been contested on full proofs, the circuit cou
should, upon a motion for a preliminary injunction, susta
626 the patent and leave the question of its validity to be det
mined upon the final hearing. Leeds & Catlin Co. v. Vict
Talking Machine Co., 213 U. S., 301, 312; Interurban Ry. & T
minal Co. v. Westinghouse E. & Mfg. Co., 186 Fed., 166, 170. (
January 22, 1912, when the court below made the order for the i
junction the validity of this patent had been contested on *full proo*
had been sustained on final hearing and its infringement by t
use of a tank in which a needle valve had been substituted for t
reducing valve described in the specification of Claude & Hess h
been adjudged on January 13, 1909. Commercial Acetylene Co.
Avery Portable L. Co., 166 Fed., 907, 910-912, 913-915" (ital
ours).

The burden rested upon appellees to show that the patent in s
had been adjudged valid in prior litigation and that there were
important new points of defense presented by these defendants th
had not previously been adjudicated in favor of the patent. W
entire disregard of the rules of law requiring appellees to make t
showing in their moving papers, appellees sought a preliminar
injunction in this case. In the argument in this court, his hon
Judge Sanborn remarked that this court could not be prevented fr
reading the opinions of other United States courts—published,
instance, in the Federal Reporter—relating to the patent in s
Reading all the published decisions of the courts regarding this p
ent will not disclose any case in which "the validity of this pat
had been contested on *full proofs*". On the contrary, the only e
dence on the subject in the record in this case shows that the defe
of the Milwaukee case was of such an incomplete and superfi
nature as to raise the suspicion that the parties had colluded
gether for the purpose of obtaining a decision sustaining the valid
of the patent, which decision obviously would not have been m
if the record in the case at bar had been presented in that first l
gation under this patent. The testimony in this case on behalf
appellants shows (Record, pages 60-63, 122-124, 126-128, 156-1
159-160, 192) that no prior patents or publications tending to ant
pate or limit the patent in suit were offered in evidence in the M
waukee case, not even the patents cited by the United States Pat
Office against the application for patent having been called to
attention of Judge Quarles. This allegation in behalf of appella
is supported by the testimony of four witnesses, namely, Orv
Sprecher, who was personally cognizant of the proceedings in
Milwaukee case (Record, page 192), and three experts who had

amined the record in the Milwaukee case (Professor William B. Potter, Mr. Percy B. Hills, and Mr. Royce A. Ruess). The duty did not rest upon appellants to introduce a certified copy of the
627 record in the Milwaukee case. That burden, as stated above, lay upon appellees. In the absence of evidence in this record showing that the Milwaukee case was contested and decided "on full proofs", there is nothing before the court upon which it can base its statement in its opinion that the validity of the patent in suit was sustained in the Milwaukee case "on full proofs". A fortiori, the opinion of this court is in error in affirming the judgment of the court below upon the basis of the Milwaukee adjudication when the evidence on behalf of appellants affirmatively shows by four credible witnesses that the hearing in the Milwaukee case was not "on full proofs", but, on the contrary, upon such an inadequate record as to amount to practically no record at all.

II.

The Burden of Proof as to Infringement Rested upon Appellees and Has Not Been Sustained by Them.

The opinion of this honorable court says:

"The claim of the defendants in this case that they do not infringe because they use terpeline instead of acetone, which claim is conditioned by conflicting testimony and by the counterclaim that the patent is not limited to the use of acetone or alcohol", etc.

Nowhere in the record nor in the brief on behalf of appellees will the alleged counterclaim be found or even suggested. On the contrary, during the oral argument in this court, Mr. Keyes Winter, one of the counsel for appellees, used substantially the following language: "We are obliged to admit that the patent has never yet been sustained except in connection with acetone, and, therefore, there is some plausibility to appellants' contention that it has not been sustained so as to entitle appellees to a preliminary injunction where a solvent other than acetone is used. We contend, however, as a matter of fact, that appellants do use acetone."

This having been the position of appellees in the oral argument on this subject by appellees, we fail to understand why the court imagined a counterclaim such as stated above.

Upon the question of fact as to whether or not appellants use acetone, the burden of proof rests upon the appellees. The burden of proof as to infringement rests upon a complainant at all stages of the case, and there are innumerable authorities to the effect
628 that upon a motion for preliminary injunction, even though the validity of the patent has been repeatedly sustained, the question of infringement is sui generis in each case, and must be proved by the party applying for the preliminary injunction beyond a doubt before such drastic and injurious action as the grant of a preliminary injunction will be taken by the court. So far from the burden of proof having been borne by appellees to show that appellants use acetone, we think that it is conclusively proved by physical exhibits and immutable signs of truth that cannot be altered by

cross-examination according to the practice of the common law that appellants do not use acetone. To say that there is conflicting testimony on this point is like saying that a dew drop conflicts with the heat of the sun. Such pretenses on the part of appellees in their feeble affidavits as attempt to suggest that appellants use acetone ought to reflect only upon the appellees, and ought to invoke for these appellants the sympathy of this court as showing the unscrupulous as well as untrustworthy methods of attack practiced by appellees.

The affidavit of Dr. Lukens was executed on October 23, 1911 (Record, page 279), which was about a month before the hearing in the lower court of the motion for preliminary injunction, Dr. Lukens being vice-president of appellant corporation (Record, page 205), and in that affidavit Dr. Lukens unequivocally stated (Record, page 276) that appellants have "never at any time * * * purchased any acetone" and that appellants have no "plant or apparatus adapted for the manufacture of acetone". This was a fair challenge to appellees, and the court may rest assured that if that statement were not absolutely true the record would contain an affidavit in rebuttal thereof, because it would have been the simplest matter in the world for appellees to have made inquiries of the very few concerns in the United States that sell acetone as to whether or not they had ever made any sales of acetone to appellants. A small quantity of lead pencils or of cigars or of any common commodity can be bought in a multitude of places; but it is impossible secretly to buy a large quantity of acetone. "This thing was not done in a corner" It could not be; and this is one of the signs of truth of appellants' contention on this question of fact that cannot be altered by any amount of cross-examination.

Moreover, cross-examination will not change the fact that the "Prest-O-Lite" tanks bear the words "This side up" and that their outlet is adjacent to the words "This side up". Nor will it change the fact that such location of the gas outlet and the words "This side up" are absent from appellants' "Fireball" tanks. Nor will cross-examination change the fact that the specification of
629 the patent in suit says that it is "essential" that the outlet shall be located above the solvent (when either of the two volatile solvents mentioned in the specification of the patent are used) or the fact that the non-partisan scientific statement of the "Scientific American" is that "In all cases where acetone is used the valve must be kept at the top to prevent its escape".

To all the statements of the court in its opinion to the effect that there is conflicting testimony well applies the following, taken from an article in April, 1912, "Law Notes," entitled "An Expert's View as to Expert Testimony":

"The most conspicuous abuse of expert testimony is this so-called 'conflict of testimony' brought about by the ambitious attorney of a guilty man, or of a fraudulent claimant arrayed against the facts, who goes out and gets witnesses, not with the thought of proving his own contention, but solely that he may bring about the desired 'conflict.' He brings in his own perjured charlatans simply that he may

abuse those opposed to them. If the attorney of the man who is attempting to profit by fraud that must be disproved by expert testimony can instil into the mind of the court, the jury, and the public, the erroneous idea that with any class of expert testimony a conflict of any kind renders it all valueless, then the fraudulent claimant may hope to win. This is the very heart of the abuse of expert testimony. * * * In a controversy where the reasons for the opinion are important, one competent witness on the right side may outweigh a hundred on the wrong side, but the specious argument is often made that even with such testimony, a conflict of any kind is fatal to the clearest and most convincing evidence, no matter if opposed by the flimsiest and most improbable contention of an opposing witness. It is especially unfortunate and discouraging if this is the view taken by the bench. Numerous oft-quoted opinions seem to assume that those who listen to such testimony have no power of discrimination whatever. If a trier of the facts says in effect, 'Here is a conflict and I will not use my own brain and my own eyes,' then he is clearly helping those who are against the facts. The New York Court of Appeals, in People v. Faber, 92 N. E. Rep. 674, and the Appellate Division, First Department, in Johnson Service Co. v. MacLernon, 127 N. Y. Sup. 431, have within the last few months discussed this question in a manner that will certainly tend to promote the ends of justice. These opinions say that the reasons for an opinion may be of the utmost importance. But if reasons will not be considered then these opinions might as well not have been written."

630

III.

"Due Process of Law" Has Been Denied David Leon Soloman.

It would seem like "due process of law" in any case would contemplate that there should be allegations against a defendant and, at least, some evidence tending to support those allegations. There is in the record no allegation that charges David Leon Soloman with having as an individual infringed the patent in suit; there is evidence that he is president of the appellant corporation and that whatever acts have been performed by him with relation to the "Fireball" tanks have been in his capacity as an officer of that corporation, and not at all in his individual capacity; and there is no evidence whatsoever that said corporation is a dummy corporation that is being used as a mere cloak for the individual acts of said David Leon Soloman. We respectfully submit that due process of law has in this case been denied David Leon Soloman, and believe that the Supreme Court of the United States will entertain an appeal in this case on this ground.

IV.

The Admission by Claude & Hess that Berthelot & Vielle Were the Discoverers of the Inexplosibility of Compressed Acetylene Dissolved in Acetone Vitiates Appellees' Claim of Invention.

Regarding the new and striking evidence produced by appellants in this case, and which it is conceded has not been passed upon by any other court, this honorable court in its opinion says:

"Counsel argues that the fact which appears in this case, but was not proved in that case, that Claude & Hess knew in June, 1897, that Berthelot & Vielle had discovered 'that the dissolution of acetylene in acetone under a pressure which is not very much over 10 atmospheres cannot explode, that only is explosive the space above the liquid which is filled with acetylene gas' takes this case out of this rule. It is, however, claimed by the complainants that the discovery here mentioned was not the invention secured by this patent, but that that invention was the combination of the tank, the liquid solvent in the tank, the acetylene forced into and secured in
631 the tank and the inlet and outlet so made and provided with valves that the tank could be conveniently charged, that the charged package could be safely and conveniently transported, and that the acetylene therein could be discharged with a low and uniform pressure wherever desired."

In the foregoing language this court seems to ignore the requirement that appellees' patent shall have been sustained as valid in a prior litigation before the issuance of a preliminary injunction was justifiable; and the opinion of Judge Quarles sustaining the validity of the patent in suit reads as clear as day that he would have regarded the patent as invalid but for his supposition (in the absence of the admission by Claude & Hess concerning the discovery by Berthelot & Vielle) that acetone is an extraordinarily good solvent for acetylene gas and that acetylene dissolved in acetone under a pressure which is not very much over 10 atmospheres cannot explode.*

The ground upon which the patent was held valid in the Milwaukee case having been shown by the evidence in this case to be unfounded in fact, it seems to us axiomatic that the Milwaukee adjudication loses all value as a basis for the grant of a preliminary injunction in this case, and this demonstrates that judicial discretion was not exercised, but was abused, by the lower court in the case at bar.

This is not all. The Rosso gas tank and the evidence concerning same show that in the prior art it was common practice to put compressed gas in a tank substantially identical with the "Prest-O-Lite" tanks. Whatever might be said to be the law as to putting into such a tank a newly-discovered chemical compound, there can be no

* If the combination of acetylene gas and acetone were non-inflammable, as stated by this court in the first paragraph of its opinion, no light would be yielded from the headlights of an automobile. It is combustion of the gas at the burners of the lamps that produces the light, and the escaping acetone burns with the acetylene and forms a carbon deposit upon the burner tips.

doubt that it did not involve invention to put an old compound into an old tank. The evidence concerning the results of the researches of Messrs. Berthelot & Vielle adduced in the record in this case and in no other litigation concerning this patent shows that the compound consisting of acetylene gas dissolved in acetone was not discovered by Claude & Hess, and the evidence, furthermore, shows that the tank itself was in common use long before their day. It is the veriest truism to say that it did not involve invention to put that old compound in that old receptacle. The Webb German patent of 1891 shows that it was old many years before the filing of the application for the patent in suit to put upon a moving vehicle, such as
632 an omnibus or the like, a tank having compressed gas forced into and secured therein and said tank having an "inlet and outlet so made and provided with valves that the tank could be conveniently charged, that the charged package could be safely and conveniently transported, and that the 'compressed gas' therein could be discharged with a low and uniform pressure wherever desired," and said gas tank being adapted for exchange when empty for a similar full one.

Everything that this court states in its above-quoted language that it is claimed is "the invention secured by this patent" was old in the Webb German patent except the placing of the gas in a solvent under pressure. That feature was, however, the result of the researches of Messrs. Berthelot & Vielle, and no inventive merit is attributable to Claude & Hess for putting Berthelot & Vielle's compound in the vehicle-lighting gas tank of the Webb patent provided with "an inlet and outlet so made and provided with valves that the tank could be conveniently charged, that the charged package could be safely and conveniently transported, and that the 'compressed gas' therein could be discharged with a low and uniform pressure wherever desired."

We think it plain that both the lower court and this court have failed adequately to weigh the tremendous import of this indisputable evidence. Cross-examination of the Webb patent will not alter its clear disclosure, nor will cross-examination of the French patent of addition containing of the admission of Claude & Hess regarding the researches of Berthelot & Vielle that resulted in the crucial discovery that acetylene dissolved in acetone under a pressure of not much more than 10 atmospheres is not explosive evaporate that admission.

Likewise, it does not amount to invention to see that the gas tank of the Webb German patent of 1891 or the Rosso gas tank is adapted to hold (instead of the particular compressed gases with which they were, respectively, filled) compressed acetylene gas dissolved in a solvent.

The Supreme Court of the United States in denying invention to every "shadow of a shade of an idea" (Atlantic Works v. Brady, 107 U. S., 192; 27 L. Ed., 438) has recently in the case of United States Repair & Guaranty Co. v. Assyrian Asphalt Co., 183 U. S., 591, 22 Sup. Ct., 87, 46 L. Ed., 342, used the following appropriate language:

"Before the time of either patent the world knew that heat disintegrated some things and melted others, and we cannot concede

invention to the thought that that might be true of different kinds of asphalt. Indeed, even in the face of the grave testimony contained in this record given by unquestionably expert men, we find it also difficult to concede that it was an exertion of invention
633 to apply heat to the edges of an excavation to make a bond between the old and the new material."

As was said by Judge Story (later Mr. Justice Story), it does not amount to invention to take a mill that has been used for grinding coffee and to grind corn with it. This doctrine has been reiterated by the courts in innumerable cases. This court itself, in the case of Mallon v. Gregg, 137 Fed., 68, decided that the conception of the application of an endless chain rake which had been constructed and used to move ice, coal, hay, grain, lumber, and crushed sugar-cane to the new use of raking sugar-cane from a loaded car before it is crushed was not an exercise of inventive genius. Similarly, we say that it is manifestly not invention to put the Berthelot & Vielle compound, consisting of gas compressed in a solvent, into the gas tanks of the Webb German patent in which had previously been contained compressed gas. Many authorities can be cited to show that this would not amount to invention even if Claude & Hess had themselves discovered the inexplosibility of acetylene gas compressed and dissolved in acetone; a fortiori, it is not invention to do this when that discovery is admitted to have been made by Berthelot & Vielle, instead of by Claude & Hess.

Let us look at a plain illustration: A lead pencil is a well known article of utility. If some one invents a new compound for the filler that makes marks he may have a patent for that new compound, but, if A takes a compound invented by B, and all that A does is to put B's compound in the old wooden shell, it does not amount to invention so to combine B's new compound with the old receptacle. If B took the patent, its virtue would reside in the newness of his compound, and he would not add one scintilla thereto by the inclusion in his claim of the old wooden inclosing means.

Another illustration: Atomizers have been used by ladies in their boudoirs to spray themselves with perfume in a finely divided state. Physicians have used atomizers to convey medicament in a finely divided state to diseased spots. A could not amount to invention for some one to put up for sale as a prepared package an atomizer filled with liquid perfume. Nor could it amount to invention for a physicians' supply house to put up prepared packages containing medicament in an atomizer. If a new medicinal compound were invented and were put within an old style atomizer to be evolved from the atomizer in the old style manner when required for use, the novelty of the compound could not lend patentability to the combination of the old atomizer and the new medicinal agent. The compound might be patentable *per se*, but it would not be more patentable because combined with the old atomizer. More-
634 over, A could not have a valid patent for making a prepared package of medicament by putting in the old atomizer a compound invented by B. This coincides exactly with the facts proved by documentary evidence in the case at bar—a new compound

was invented by Berthelot & Vielle, and Claude & Hess did nothing more than to put it in the closed receptacles of the Webb 1891 German patent, into which compressed gas had been forced and secured therein long before the invention of Berthelot & Vielle, said tank having an "inlet and outlet so made and provided with valves that the tank could be conveniently charged," said "charged package" being "safely and conveniently transported," and the compressed gas therein being "discharged with a low and uniform pressure wherever desired," the Webb German patent, furthermore, describing a system of refills and exchanges and the purpose of the system, as for lighting vehicles, such as omnibuses and the like.

In delivering the opinion of the Supreme Court of the United States in the case of Heald v. Rice, 104 U. S., 737, 753, 754, 755, 26 L. Ed., 910, 916, 917, Mr. Justice Mathews said:

"The second principal objection to the validity of the Rice reissued patent is, that it is anticipated by the Morey patents. We are of opinion that it also is well taken. * * * It [Morey's re-issued patent of May 4, 1875] applies to every description of threshing-engines and boilers, whether fire-box or return-flue. It is true, that it does not specify either class, but it embraces both by its language; and in its application to both it operates in precisely the same manner and with precisely similar effect. If there is any superiority in the return-flue boilers used with this attachment as a straw burner, over the fire-box boiler, when used in the same way, the superiority is due, not to any difference in the straw-feeding attachment nor in the mode of its operation, nor to any new feature of the combination, but merely to the superiority of the return-flue boiler itself. And it does not militate against the validity of Morey's patent, nor limit the extent and effect of its application, to concede what is claimed: that he was not aware, at the time of his invention, of the superior value of its application to return-flue over fire-box boilers, or that the discovery of that superiority is attributable to Rice. That application of it is within the scope and provision of Morey's invention, whether it had been tested by his experience or was anticipated by his foresight or not. If, at the date of Morey's invention, return-flue boilers had not been known, but had been subsequently invented, his patent, as applied to them, would still have prevailed against any new claimant; for the new application does not produce any
635 new effect. It is only the occasion which is new; the use itself is merely analogous. * * * *There was no patentable invention in Rice's adaptation. The return-flue boiler, it is admitted, was old. The Morey attachment had been already invented. The idea and principle of its operation, in adapting boilers to the use of straw as a fuel, was the essence of his invention. Rice, it is confessed, discovered nothing more than that, for such purposes, a return-flue boiler was better than fire-box boilers, which were the only kind that had then been used. 'But this,' in the language of Mr. Justice Nelson in Hotchkiss v. Greenwood, 11 How., 266, 'of itself can never be the subject of a patent. * * * ' The case would not be altered if we suppose that, at the date of Morey's patent,*

there had been also a valid patent outstanding in a stranger for the return-flue boiler. On that supposition could it for a moment be contended that Rice could secure for himself a valid patent for the combination as an improvement on both? What invention could he claim? He uses Morey's device precisely as Morey's patent contemplated, and the Cornish boiler exactly as it was designed to be used. And in the combination each operates separately, producing its own results. There was no inventive resource drawn upon to bring them together. Could not the owners of the patents for the straw-feeding attachment and the return-flue boiler unite their machines and work them together, in defiance of a claim for the combination? To ask the question is to answer it (Italics ours)."

V.

Declination of the Appellate Courts to Decide the Questions Passed up to them for Decision by the Lower Court Resulted in the Bankruptcy of Leeds & Catlin Company.

The quotation that the court makes from the opinion of the Circuit Court in the case of Victor Talking Machine Company v. Leeds & Catlin Company, 148 Fed., 1022, shows that the judge in the lower court in that case felt "constrained to grant the injunction in order to permit an appeal and a determination of the questions at the earliest possible moment", the law at that time and at the time when the hearing on motion for preliminary injunction in the case at bar was heard not permitting an appeal by complainant from an order refusing an injunction pendente lite, but granting the right of appeal to a defendant from an order granting such an injunction.

The lower court thought that the appellate court would decide
636 the important questions involved, and expressly said that the injunction would be granted so that an appeal might be taken to the end that there might be "a determination of the questions at the earliest possible moment."

In the Leeds & Catlin Company case, the United States Circuit Court of Appeals for the Second Circuit did not justify the expectations of the lower court and decide the important questions involved, and the defendant in that case, having fortunately been able to secure the unusual writ of certiorari from the Supreme Court of the United States, was met with the further disappointment that the Supreme Court of the United States did not decide those questions, but relegated Leeds & Catlin Company to bankruptcy (175 Fed., 309).

The effect upon the unfortunate Leeds & Catlin Company of the failure of the different courts to whom its cause was submitted to decide the questions involved therein was as disastrous to it as if the litigation against it had not been as unfounded and unjust as is that against appellants in the case at bar. With such results arising from the declination of the courts to decide the questions which the lower court passed up for decision by them, we are reminded of the graphic description by Charles James Fox of "a political pause" in a speech

delivered by him during a truce in the long war between England and France.*

In these days when bar associations and judges and legislatures and periodicals and even the man in the street are uniting in one voice to demand such improvements in legal procedure that justice shall be more quickly done and the law's delays abrogated, it seems strange that upon a record consisting of documentary evidence, that cannot lie, this court should content itself in passing upon a record that has cost a small fortune to prepare for this court with simply reserving for future consideration (if perchance appellants can
637 raise another to bring this case to this court for further consideration) all the questions presented by that record "except the question of the abuse by the court below of its discretion in the issue of the injunction," notwithstanding the fact that the Supreme Court of the United States in Mast, Foos & Company v. Stover Manufacturing Company, 177 U. S., 485, 495, found public use more than two years before the application for the patent involved in that suit proved by mere affidavits and dismissed the bill of complaint upon an appeal from an order refusing a preliminary injunction, although the courts are unanimous in holding that the defense of two years' public use, thus sustained on mere affidavits by the Supreme Court of the United States, is one which must be proved beyond reasonable doubt.

VI.

The Claim of the German Claude & Hess Patent is for a Gas-Package, and the Process Described in that Patent is the System or Practice or Process of Doing Business in a Certain Way.

We understand the purport of the court's opinion to be to reserve its opinion upon all questions the case presents until the case reaches this court again upon an appeal after final hearing. We, therefore, ask, at least, a modification of the opinion of this court with respect

*"'But we must pause,' says the honorable gentleman. * * * In former wars, a man might at least have some feeling, some interest, that served to balance in his mind the impressions which a scene of carnage and death must inflict. But if a man were present now at the field of slaughter, and were to inquire for what they were fighting—'Fighting!' would be the answer; 'they are not fighting; they are pausing'. 'Why is that man expiring? Why is that other writhing in agony? What means this implacable fury? The answer must be, 'You are quite wrong, sir, you deceive yourself—they are not fighting—do not disturb them—they are merely pausing! This man is not expiring with agony—that man is not dead—he is only pausing! Bless you, sir, they are not angry with one another, they have now no cause of quarrel; but their country thinks there should be a pause. All that you see is nothing like fighting; there is no harm, nor cruelty, nor bloodshed in it; it is nothing more than a political pause. It is merely to try an experiment—to see whether Bonaparte will not behave himself better than heretofore; and, in the meantime, we have agreed to pause, in pure friendship!'"

to the passages therein concerning the German patent, which we shall here quote:

"The terms of the British patent lent themselves more strongly than those of the German patent to the argument that it was for an apparatus * * *. There had been, it is true, no adjudication of the character of the German patent, but its terms are much less favorable to the contention that it is a patent for an apparatus than are those of the British patent. The specification mentions the 'present process' five times, describes it, describes two apparatus, gives figures of them, and closes with these words: 'Indeed, the apparatus described above and shown in Figures 1 and 2 are only given by way of example for explaining the process and the latter is independent of the described constructional forms.' The German patent has but one claim, and that reads in this way: 'The employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating and the 638 like, characterized by the acetylene being absorbed under pressure by a suitable liquid saturated with acetylene being preserved or contained in suitable vessels from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed'. * * * that the terms and claim of the German patent were more favorable to a like decision regarding that patent than were those of the British patent."

For an opinion that purports to decide nothing except that the discretion of the lower court was not abused, we think that this language that we have just quoted is well adapted to work appellants much harm at the final hearing in the lower court. We strenuously contend that these statements in this court's opinion are erroneous in fact and irrelevant in law, and that the German patent to Claude & Hess patented exactly the same thing that the patent in suit attempts to cover. It is manifest, however, that appellants will approach final hearing, to which this court now relegates them, under a very serious handicap, as the lower court can not fail to take these statements as so far indicating the mind of this court and its probable decision as to justify the lower court in ignoring or practically ignoring the German patent at final hearing.

The court must have misunderstood the German patent, however, or it would not have made the foregoing statements, and we, therefore, ask a reconsideration of its entire decision, for the reason that the admitted fact that "there had been * * * no adjudication of the character of the German patent" shows that the lower court abused its discretion in granting the preliminary injunction in this case, in which said German patent was adduced as evidence of the expiration of the patent in suit, whereas the same had never been previously used in any other litigation for that purpose.

We believe it to be indisputable as a matter of law and the proper administration of justice that things are to be considered for what they are and not for what they are called, and that the true meaning and not the mere seeming meaning of language should dictate the decisions of the courts.

The Supreme Court of the United States in the case of Leeds &

Catlin Company v. Victor Talking Machine Company, 213 U. S., 301, 316, 53 L. Ed., 805, 812, said: "A patent may embrace more than one invention"; and the Supreme Court cited as authority for this statement the case of United States ex rel. Steinmetz v. Allen, 192 U. S., 543; 24 Sup. Ct. Rep., 416; 48 L. Ed., 555. The Supreme Court, furthermore, said in its opinion in the Leeds & Catlin case that "A process and an apparatus by which it is performed * * * may be found in one patent; they may be made the subject of different patents. So may other dependent and related inventions."

639 In the case of United States ex rel. Steinmetz v. Allen, the Supreme Court of the United States held that both a process and an apparatus for practicing it may be included in one patent, and to the same effect are the decisions of the Supreme Court in the Telephone Cases, 126 U. S., 1; 31 L. Ed., 863; 8 Sup. Ct., 778, and in Hogg v. Emerson, 11 How., 587; 13 L. Ed., 824.

Even if the German Claude & Hess patent includes process and filling apparatus and receptacles filled with compressed acetylene gas dissolved in acetone, that phase or part of it that is for the gas-package must be effective to limit the term of the patent in suit; and the fact is that that phase of it is the subject-matter of the claim of the German patent as well as being fully described in the specification.

When the statute enumerates four different classes of inventions, namely, arts (processes), machines (apparatus), manufactures (products), and compositions of matter, it does not say, and it does not mean, that a man may obtain a valid patent for both sides of a sheet of paper by calling one side a process and the other side an apparatus or by calling one side a process and the other side a product. Such doctrine is denied by a large number of authoritative cases, including several decisions by the Supreme Court of the United States, cited between pages 39 and 50 of the main brief on behalf of appellants in this court. We understand the language of the Supreme Court of the United States in the Leeds & Catlin Company case to be in consonance with these decisions and with its decision in the case of United States ex. rel. Steinmetz v. Allen, supra, in which it quotes: "But a process and a machine for practicing a process are not necessarily one and the same invention."

If it were true that a man might obtain separate patents for two aspects of the same invention, then Touchstone, in "As you like it," was entitled to four patents, because of his profound observation that "Drink being poured out of a cup into a glass by filling the one doth empty the other." One of his patents would be a process patent for filling the glass; another would be a process patent for emptying the cup; a third would be for the apparatus, i. e., the cup used in filling the glass; and a fourth would be an apparatus patent for the glass that acted as a receiver wherewith to empty the cup.

The Court of Appeals of the District of Columbia in re Creveling, 117 O. G., 1167, made a decision extremely pertinent to this point to the effect that where application is made for a patent upon an alleged method after a patent has been granted upon the apparatus and it appears that the substitution of the word "means" for the

word "method" at two places would not change the sense and
640 would make the disclosure in the application the same as that in the patent, to grant the alleged method claims would result in two patents for substantially the same thing.

In the case of A. B. Dick Company v. Henry (C. C. S. D. N. Y.), 160 Fed., 690, 692, Judge Holt said:

"The only step, therefore, which can be called a process, in making a stencil sheet under Dick's process patent, is that the combination held to have been patented by Fuerth, and decided to have been invented by him [i. e., the stencil sheet, composed of paper waxed with paraffin], is put into the ordinary typewriting machine and printed there [without ink] and taken out again. That, in my opinion, is not a process, within the meaning of the patent law, but is a mere function, or work of a machine, which under the authorities, is not patentable. Corning v. Burden, 15 How., 257, 14 L. Ed., 683; Risdon Locomotive Works v. Medart, 158 U. S., 68, 15 Sup. Ct., 745, 39 L. Ed., 899; Westinghouse v. Boyden Power Brake Company, 170 U. S., 537, 18 Sup. Ct., 707, 42 L. Ed., 1136; Bush v. Jones, 184 U. S., 607, 22 Sup. Ct., 511, 46 L. Ed., 707."

It will materially aid the court in its consideration of the Claude & Hess German patent, if this court conceives said German patent to be a process patent, to ask itself the question, What is the process patented by the German patent? Further, What is the process to which the word "process" five times appearing in the specification refers? Again, does the word "process" as appearing five separate times in the specification of the German patent refer always to the same thing?

The process of dissolving acetylene gas under pressure in a solvent the record shows to have been known long before the days of Berthelot & Vielle. The process of dissolving acetylene gas under pressure in acetone was not invented by Claude & Hess, but was due to the researches of Berthelot & Vielle. What, then, would this court say is the process of the Claude & Hess German patent? Is it the act of putting the compound of Berthelot & Vielle in the transportable, refillable, and exchangeable valve-controlled gas tank of the Webb 1891 German patent, which that patent described as intended for use on omnibuses and similar vehicles? If so, is not such a process so clearly unpatentable as to force the conclusion that the claim of the German patent is for the very combination of four elements found in claims 1, 2, and 5 of the patent in suit?

If, however, the Supreme Court of the United States in deciding the Leeds & Catlin case used any language that could be misunderstood to say that a man may have two patents based upon the
641 same inventive idea or act, because in one of those patents he calls his invention a process and in the other an apparatus, the above-mentioned authorities cited in our main brief in this court show that such language cannot be law. The statute is exhausted when an invention has been patented by one patent. In naming the different classes of inventions the statute merely means that if a man has invented something that cannot be properly denominated a machine, he may, notwithstanding, have a patent for it if any of the

three other terms appearing in the statute describes it. It does not mean that "A process and an apparatus by which it is performed are distinct things." This court in the case of The Model Bottling Machinery Company v. Anheuser-Busch Brewing Association, 190 Fed., 573, 579, held that an apparatus patent did describe a process that differed (as conceded by the court in its opinion) from the process claimed by a process patent in the important respect of the difference between intermittent and continuous movement, said continuous movement producing a chemical effect that was not obtained by the intermittent apparatus, this court saying in the case of the American Steel & Wire Company v. Denning Wire & Fence Company, 194 Fed., 117, 120, that "It can hardly be questioned that continuous action constitutes a radical difference from intermittent action in the mode of operation, and, also, implies a corresponding difference in structure."

The word "process" has so many meanings that the court can not characterize the German patent as a process patent from the fact that its "specification mentions the 'present process' five times." Numberless instances could be cited where in a specification of a patent entitled "Apparatus for," etc., the words would be found "according to the present process," etc.; "my improved process," etc.; and the like. Misuse of the term "process" has, in the observation of the writer, gone to the extent, both in the specifications of patents and in the opinions of the courts, of calling a naked apparatus a process. A pear can not be made an apple by calling it so; and the German Claude & Hess patent can not be made a process patent by calling it one, and the claim of the German patent is clearly not a process claim, for the reason that it mentions two mechanical elements, namely, the vessel or tank and the pressure regulator. Not an Examiner or officer in the United States Patent Office can be found who would allow the claim of the German patent as a process claim. In every instance where a claim is submitted to the United States Patent Office for a process and any element of apparatus is mentioned therein, the Examiner handling that case will require the elimination of any reference to the apparatus element or elements,

642 because, as said by Mr. Justice Bradley in Tilghman v. Proctor, 102 U. S., 707, 728, 26 L. Ed., 279, 287, "A process is an act, or a mode of acting."

In the case of Piper v. Brown, 4 Fish. Pat. Cas., 175, Fed. Case No. 11,180 (19 Fed. Cas., 720), "process" is thus defined:

"When the result or effect is produced by chemical action, or by the application of some element or power of nature, or of one substance to another, such modes, methods, or operations are called processes."

A "pressure regulator" is not a process, and its function of equalizing pressure is not a process within the meaning of the patent law. A "suitable vessel" is not a process, and its function of containing anything that is put into it is not a process within the meaning of the patent law. A claim that mentions any apparatus element is not a process claim. If a claim contains descriptive matter, like the

claim of the Claude & Hess German patent does in addition to specific mechanical elements, it does not thereby become a process claim. According to United States practice, it may thereby be made unduly functional, or it may be thereby made objectionably verbose, but the presence of one mechanical element in a claim necessarily deprives it of the character of a process claim.

For instance, if a claim were drawn for a lead pencil couched in the following language: "The employment of the combination of graphite and a cohering element, the two being compacted together under pressure for the purpose of utilizing graphite for making marks known as writing upon paper, wood, and the like, characterized by the graphite being mixed under pressure with a suitable viscous liquid to make its particles cohere more closely and adhesively together, and said combination being preserved or contained in a suitable vessel or receptacle, such, for instance, as a hollow cylinder, from which the graphite can protrude for use, said cylinder preferably being provided with a tapered point," would such a claim be for a process? Of course, not. It would not be a claim for the process of writing; nor would it be a claim for the process of supplying graphite for the purpose of writing. It would be a claim for the article of manufacture—a lead pencil, just as we pointed out in appellants' main brief in this court that the claim of the Claude & Hess German patent and the claims involved in this suit of the Claude & Hess United States patent are for a gas package, under the heading in that brief beginning at page 34 "The True Understanding of the Patent in Suit is that it is for an Article of Manufacture."

In the foregoing illustration, neither the process of writing with graphite nor the process of supplying graphite for writing would be patentable under the patent law of any nation. The one con-
643 sists merely of the idea of using graphite for writing and the other consists merely of the idea of supplying graphite in a convenient form for writing. That mere ideas are not patentable is so well known as to require the citation of no authorities to substantiate the proposition.

Yet the language at the end of the specification of the Claude & Hess German patent, "Indeed, the apparatus described above and shown in Figures 1 and 2 are only given by way of example for explaining the process, and the latter is independent of the described constructional forms," could be used just as appropriately of our lead pencil claim illustration given above as in said Claude & Hess German patent; and this shows that when properly understood it does not bear the meaning attributed to it by this court in its opinion. Imagining it to precede the proposed claim for a lead pencil, Figure 1 would show the apparatus for filling and compressing the combined graphite and cohering element into the hollow cylinder forming the shell of the lead pencil; and Figure 2 would depict the completed lead pencil. Then this language would mean that there might be variations in the construction of the apparatus for compressing the graphite and its cohering element and for placing same within the hollow cylinder, and that there might be variations in the shape of the completed article, as, for instance, it might be either round or

rectangular or octagonal or elliptical in shape, and might be closed at one end and open at the other or might be open at both ends, for instance. The process of supplying graphite in form suitable for convenient use for the purpose of writing would be "independent of the described constructional forms." Nevertheless, the claim is in form only for the completed article of manufacture, namely, the prepared package of graphite adapted for commercial distribution and convenient use for the purpose of writing.

The exact applicability of the foregoing illustration to the Claude & Hess German patent will be perceived if the nature of that patent is remembered, inasmuch as it describes a system (for which the word "process" is ambiguously used in the German patent and in the opinion of this court) of supplying acetylene gas for safe and convenient transportation and use.

Any written document is to be construed as a whole, and this court in the case of O. H. Jewell Filter Company v. Jackson, 140 Fed., 340, 343, 344, has laid down the same rule for the interpretation and construction of patents for inventions.

What process does the specification of the Claude & Hess German patent mention at its outset? It says: "In the processes cus-
644 tomary heretofore for storing and utilizing acetylene, the gas," etc. Plainly the process contemplated by that sentence is not alone the process (invented by Berthelot & Vielle) of rendering compressed acetylene gas inexplosible by dissolving it in acetone. Much confusion in this litigation has been occasioned by this very misconception. The "process," however, referred to by the opening sentence of the specification of the German patent is the process of storing and utilizing acetylene gas. The patent might as well have said: "In the practice customary heretofore for storing and utilizing acetylene," etc., or "in the systems customary heretofore for storing and utilizing acetylene," etc.

The specification of the German patent then proceeds to tell about the new practice or system or process that it suggests: First, how to render the acetylene inexplosive when reduced to small compass by compression (which is the only chemical or patentable process mentioned in the specification of the Claude & Hess German patent, and which our evidence shows was discovered by Berthelot & Vielle); Second, how to introduce it into small portable flasks or tanks or vessels, such as the "Prest-O-Lite" tanks; Third, how these filled receptacles or flasks can be transported from a central filling station to the place of use, and there, by means of a pressure regulator, the gas be evolved regularly as required for use; Fourth, how the empty flasks or tanks can be returned to the central filling station to be recharged, full ones being received in exchange for same and transported to the place of use; and, Finally, details of the mechanism for filling the flasks or small receptacles and details of the construction of said flasks, which details of construction of both flasks and filling mechanism the specification of the German patent concludes by stating to be immaterial, inasmuch as this new system of distributing acetylene gas packages for use is independent of the exact

shape or construction of the packages, and is independent of the exact form of apparatus by which the same are filled.

After this, the German patent concludes with a claim which can be interpreted in only one way, when regard is had for what the patent laws of all nations hold to be unpatentable. It can be interpreted only as a claim for the gas package composed of a vessel of any shape or size, but preferably of a size convenient to be transported, the same being controlled by a pressure regulator or other suitable valve governing both the inlet and the outlet, and said vessel or receptacle containing compressed acetylene dissolved in acetone or other suitable solvent.

If the claim of the German patent be not for this prepared gas package, and if it be insisted that same is for a process, we immediately perceive the absurdity of such contention, because it is
645 then not for anything patentable under the laws of Germany or any other country, but is for a mere idea, that is to say, a system of doing business, said system of doing business being the same (except for the addition by Claude & Hess of the Berthelot & Vielle discovery concerning the solution of acetylene in acetone) as that described in the Webb German patent of 1891 of filling and transporting to the place of use relatively small flasks provided with pressure regulators with compressed gas for the purpose of use on omnibuses and other vehicles, the same to be returned when empty to a central filling station and there exchanged for full ones to be transported to the place of use.

Respectfully submitted,

FIREBALL GAS TANK & ILLUMINATING COMPANY AND
DAVID LEON SOLOMAN,
By HUGH K. WAGNER,
Counsel for Petitioners, Suite 503 *Fullerton Building, St. Louis, Missouri.*

October, 1912.

I hereby certify that I am counsel for the appellants in this cause and that in my judgment the above petition for rehearing is well founded in point of law and fact and ought to be granted.

HUGH K. WAGNER,
Counsel for Petitioners.

(Endorsed:) Filed Oct. 30, 1912. John D. Jordan, Clerk.

646 (*Order Denying Petition for Rehearing.*)

And on the nineteenth day of November, A. D. 1912, in the record of the proceedings of said Circuit Court of Appeals is an order denying the petition for a rehearing in said cause, in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit, September Term, 1912, Tuesday, November 19, 1912.

No. 3745.

FIRE BALL GAS TANK AND ILLUMINATING COMPANY et al., Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY et al.

Appeal from the District Court of the United States for the Eastern District of Missouri.

This cause came on this day to be heard upon the petition for a rehearing, filed by counsel for appellants.

On Consideration Whereof, it is now here ordered by this Court, that said petition for a rehearing of this cause, be, and the same is hereby, denied.

November 19, 1912.

(*Motion for Stay of Mandate.*)

And on the twenty-first day of November, A. D. 1912, a motion for stay of mandate was filed in said cause, in the words and figures following, to-wit:

In the United States Circuit Court of Appeals for the Eighth Circuit.

In Equity. No. 3745.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Appellants,
v.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Appellees.

Motion for Stay of Mandate.

Now come the appellants in the above-entitled cause, Fireball Gas Tank & Illuminating Company and David Leon Soloman, and respectfully show to this honorable court that, in accordance with the law in such cases made and provided, they will as soon as
647 possible petition in due form the Supreme Court of the United States for the issuance of its writ of certiorari to review the record and decision of this court in this cause.

Wherefore, these appellants humbly pray that the issuance of the mandate from this court to the United States District Court for the Eastern Division of the Eastern Judicial District of Missouri in this cause may be stayed until the Supreme Court of the United

States shall have passed upon appellants' petition for certiorari, and, in case the Supreme Court of the United States grants its said writ of certiorari in this cause, until the termination of the proceedings under and by virtue of said writ of certiorari.

HUGH K. WAGNER,
Counsel for Appellants.

(Endorsed:) In Equity. No. 3745. In the United States Circuit Court of Appeals for the Eighth Circuit. Fireball Gas Tank & Illuminating Company et al., Appellants, v. Commercial Acetylene Company and The Prest-O-Lite Company, Appellees. Motion for Stay of Mandate. Filed Nov. 21, 1912, John D. Jordan, Clerk.

(Order Granting Motion for Stay of Mandate, etc.)

And on the twenty-third day of November, A. D. 1912, in the record of the proceedings of said Circuit Court of Appeals is an order staying the mandate in said cause, etc., in the words and figures following, to-wit:

United States Circuit Court of Appeals, Eighth Circuit, September Term, 1912, Saturday, November 23, 1912.

No. 3745.

FIREBALL GAS TANK AND ILLUMINATING COMPANY et al.,
Appellants,
vs.
COMMERCIAL ACETYLENE COMPANY et al.

Appeal from the District Court of the United States for the Eastern District of Missouri.

Upon consideration of the motion of appellants for an order staying the mandate pending an application to the Supreme
648 Court for a writ of certiorari, it is now here ordered that the mandate in this cause be, and the same is hereby, stayed until said application shall have been presented to the Supreme Court and determined by that court, provided said application for certiorari is filed in the Supreme Court within forty days from and after this date.

November 23, 1912.

649 *(Clerk's Certificate.)*

United States Circuit Court of Appeals, Eighth Circuit.

I, John D. Jordan, Clerk of the United States Circuit Court of Appeals for the Eighth Circuit, do hereby certify that the foregoing contains the transcript of the record from the District Court

of the United States for the Eastern District of Missouri as prepared and printed under the rules of the United States Circuit Court of Appeals for the Eighth Circuit under the supervision of its Clerk and full, true and complete copies of all the pleadings, record entries and proceedings, including the opinion, in the United States Circuit Court of Appeals for the Eighth Circuit, in a certain cause in said Court, wherein the Fireball Gas Tank and Illuminating Company and David L. Soloman are Appellants, and the Commercial Acetylene Company and The Prest-O-Lite Company are Appellees, No. 3745, as full, true and complete as the originals of the same remain on file and of record in my office.

In testimony whereof, I hereunto subscribe my name and affix the seal of the United States Circuit Court of Appeals for the Eighth Circuit, at office in the City of St. Louis, Missouri, this twenty-third day of December, A. D. 1912.

[Seal United States Circuit Court of Appeals, Eighth Circuit.]

JOHN D. JORDAN,
Clerk of the United States Circuit Court of Appeals for the Eighth Circuit.

650 In the United States Circuit Court of Appeals for the Eighth Circuit.

In Equity. No. 3745.

FIREBALL GAS TANK & ILLUMINATING COMPANY et al., Appellants,
v.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY, Appellees.

Stipulation.

It is hereby stipulated by and between counsel for appellants and counsel for appellees that the certified transcript of the record in this cause heretofore filed with the Clerk of the Supreme Court of the United States in cause No. 905, October Term 1912, in the said Supreme Court shall be taken and accepted as a return to the writ of certiorari from said Supreme Court of the United States to said United States Circuit Court of Appeals for the Eighth Circuit granted February 3, 1913, and issued February 10, 1913.

Dated at St. Louis, Missouri, this 13th day of February, 1913.

HUGH K. WAGNER,
Counsel for Appellants.
FORDYCE, HOLLIDAY & WHITE,
Counsel for Appellees.

(Endorsed:) No. 3745. In the United States Circuit Court of Appeals for the Eighth Circuit. In Equity. Fireball Gas Tank & Illuminating Company et al., Appellants v. Commercial Acetylene Company and The Prest-O-Lite Company, Appellees. Stipulation. Filed Mar. 5, 1913, John D. Jordan, Clerk.

651 UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Eighth Circuit, Greeting:

Being informed that there is now pending before you a suit in which Fireball Gas Tank & Illuminating Company and David L. Soloman are appellants, and Commercial Acetylene Company and The Prest-O-Lite Company are appellees, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the District Court of the United States for the Eastern District of Missouri, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Circuit Court of Appeals and removed into the
652 Supreme Court of the United States, do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Edward D. White, Chief Justice of the United States, the tenth day of February, in the year of our Lord one thousand nine hundred and thirteen.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

653 *Return to Writ.*

UNITED STATES OF AMERICA,
Eighth Circuit, ss:

In obedience to the command of the within writ of certiorari and in pursuance of the stipulation of the parties, a full, true and complete copy of which is hereto attached, I hereby certify that the transcript of record furnished with the application for a writ of certiorari in the case of Fireball Gas Tank and Illuminating Company and David L. Soloman, Appellants, vs. Commercial Acetylene Company and The Prest-O-Lite Company, is a full, true and complete transcript with all the pleadings, proceedings and record entries in said cause.

In testimony whereof, I hereunto subscribe my name and affix the seal of the United States Circuit Court of Appeals for the Eighth Circuit, at office in St. Louis, Missouri, this fifth day of March, A. D. 1913.

[Seal United States Circuit Court of Appeals, Eighth Circuit.]

JOHN D. JORDAN,
Clerk of the United States Circuit Court of Appeals for the Eighth Circuit.

[Endorsed:] File No. 23,480. Supreme Court of the United States, No. 905, October Term, 1912. Fireball Gas Tank & Illuminating Company et al., vs. Commercial Acetylene Company et al. Writ of Certiorari. Filed Mar. 5, 1913. John D. Jordan, Clerk.

654 [Endorsed:] File No. 23,480. Supreme Court U. S., October Term, 1912. Term No. 905. Fireball Gas Tank & Illuminating Company et al., Petitioners, vs. Commercial Acetylene Company et al. Writ of Certiorari and Return. Filed March 7, 1913.

2

IN THE

SUPREME COURT OF THE UNITED STATES.

Office Supreme Court, U. S.
FILED.
JAN 13 1913
JAMES H. McKENNEY,
Clerk.

OCTOBER TERM, 1912.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN,
Petitioners,

vs.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY,
Respondents.

In Equity.

PETITION FOR CERTIORARI AND BRIEF IN SUPPORT THEREOF.

HUGH K. WAGNER,
Counsel for Petitioners,
Suite 503 Fullerton Building,
ST. LOUIS, MISSOURI.

St. Louis Law Printing Co., Printers' Bldg., Ninth and Walnut. Bell Main 1919.

IN THE

SUPREME COURT OF THE UNITED STATES.

No. 905.

OCTOBER TERM, 1912.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN,

Petitioners,

vs.

COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY,

Respondents.

} In Equity.

PETITION FOR CERTIORARI AND BRIEF IN SUPPORT THEREOF.

To the Honorable, the Chief Justice and Associate Justices of the Supreme Court of the United States:

Now come Fireball Gas Tank & Illuminating Company and David Leon Soloman, the petitioners in the above-entitled cause, and pray that this Honorable Court will issue its writ of *certiorari* directed to the United States Circuit Court of Appeals for the Eighth Circuit, requiring that the record of this cause in said court and its decree be certified to this court for the determination of said cause by this Honorable Court and, thereupon, that this court will proceed to correct the

errors complained of herein, by reversing said decree and giving to your petitioners such other and further relief as the nature of the case may require and as this court may deem meet and proper. For grounds of said petition, your petitioners respectfully state the following reasons:

I.

The patent on which this suit against these petitioners is based expired not later than June 30, 1910, under section 4887, R. S. U. S., according to the decision just rendered by the United States Circuit Court of Appeals for the Seventh Circuit, in the case of the same complainants against Schroeder *et al.*, the opinion in which case is printed in full at the end of this petition. In that case, the United States Circuit Court of Appeals for the Seventh Circuit decides, as did also the lower court in the case recently argued before this Court of Cameron Septic Tank Company v. City of Knoxville, that the Treaty of Brussels of December 14, 1900 (proclaimed in 1902), and the statute of 1903 did not abrogate section 4887, R. S. U. S., nor retroactively affect the term of the patent involved.

The record in the case at bar shows (Record, pages 216, 221) that the petitioners' sales began on March 3, 1911—*upward of a year after the expiration of the patent in suit.*

Petitioners stand enjoined from alleged infringement of an expired patent, no act alleged to constitute infringement having been committed before the expiration of said patent. The record in the case at bar, though only that upon motion for preliminary injunction, is largely documentary, and is as full as, if not fuller than, the record at final hearing upon which the above-mentioned decision of the United States Circuit Court of Appeals for the Seventh Circuit is founded.

The corresponding British patent, upon which the said decision of the United States Circuit Court of Appeals for the Seventh Circuit is chiefly based, is printed in full in the record (Record, pages 445-452, 231-232).

Upon the other aspect of the said decision of the United States Circuit Court of Appeals for the Seventh Circuit, that a needle valve "is not the equivalent in structure or function of the reduction-valve described and claimed in the patent as a material element of the combination", the record in the case at bar will be found as full as any that could be presented at final hearing or as was before the United States Circuit Court of Appeals for the Seventh Circuit in the case just decided by it. It is admitted by respondents that these petitioners use a needle valve, and not a reduction-valve.

II.

Due process of law has been denied the individual petitioner herein, David Leon Soloman, there being in the record neither *allegata* nor *probata* suitable to charge him with being an individual infringer of the patent in suit, the evidence merely showing that he is the president of the petitioner corporation. The evidence does not attempt to show, and there is not the slightest allegation, that the corporation is a "dummy" corporation. Unless a natural person is using the artificial entity of a corporation as a subterfuge and cloak for his personal acts, he cannot be held liable for the acts of the corporation.

III.

The present petition for *certiorari* asks a review of the proceedings in the courts below whereby these petitioners stand enjoined *pendente lite* for alleged infringement of a patent that Judge Kohlsaat has twice decided expired on June 30, 1910 (188 Fed., 85, 197 Fed., 908), his decision to that effect having just been affirmed by the Court of Appeals.

At the time of the hearing of the motion for preliminary injunction in the case at bar (November, 1911), the law that was then in effect provided that, if such preliminary injunction were denied by the court, the moving party was not entitled to an appeal from such denial to the United States Circuit Court of Appeals, but that, if the same were granted, the enjoined party or parties might take such appeal to said United States Circuit Court of Appeals.

At said hearing, the respondents here (complainants in the Circuit Court) argued to the judge holding the said Circuit Court that it would be more expedient for him to grant the preliminary injunction or injunction *pendente lite* against these petitioners than to deny it, for the reason that these petitioners (defendants in the said Circuit Court) would be able to take an appeal to the United States Circuit Court of Appeals for the Eighth Circuit, and thereby all parties and the lower court could quickly obtain the benefit of the opinion on the questions in this case of the said Circuit Court of Appeals for the Eighth Circuit, whereas if said injunction *pendente lite* against these petitioners were denied, the respondents here (complainants in the said Circuit Court) would be unable under the law as it then stood to take such an appeal.

The judge who heard said application for injunction *pendente lite* in this cause (Hon. Smith McPherson) used during the course of the hearing of the said application for preliminary injunction language substantially as follows: "You people will not rest satisfied with my decision of the questions in this case; they ought to be decided by the Court

of Appeals. I think, therefore, that I will grant this injunction and let you take your appeal as soon as possible, so that these questions can be settled for everybody by the Court of Appeals."

The judge of the lower court rendered neither an oral nor a written opinion when he granted the preliminary injunction in this case, and the foregoing quotation of the language of that judge contains, as near as petitioners are able to state the same, the reason why the injunction *pendente lite* was issued in this cause—all the questions in the cause being expressly passed up to the United States Circuit Court of Appeals for the Eighth Circuit for its decision, for the guidance of the parties and of the lower court.

Nevertheless, said United States Circuit Court of Appeals for the Eighth Circuit, when rendering its decision of the said appeal, expressly declined to express its opinion upon any of the said questions (198 Fed., 650, 658).

The result is that the petitioners here (defendants in the court of first instance) have been heard by two courts each of which has declined to pass upon the tremendously important defenses urged by these petitioners (the nature of which can be glimpsed by inspection of the petition for rehearing in the **Court of Appeals, Record, page 625**), notwithstanding which an injunction *pendente lite* is in ruinous effect against the business of these petitioners. Although Judge Kohlsaat has twice decided that the patent in suit expired not later than June 30, 1910, under section 4887 R. S. U. S., and although the United States Circuit Court of Appeals for the Seventh Circuit has affirmed that decision, the nature of this injunction in the case at bar is such that as against these petitioners it will have the effect (for practical purposes, being *pendente lite*) of abrogating section 4887 R. S. U. S. and of extending the life of the patent in suit, notwithstanding said statute, until substantially seventeen years from the date of its issuance.

IV.

Any decision granting an injunction under, or upholding the validity of, the patent in suit is contrary to the decision of this court in the case of Steward v. American Lava Company, 215 U. S., 161; 54 L. Ed., 139.

V.

Any decision granting an injunction under the patent in suit or holding that the same did not expire either on June 30, 1910 (with the corresponding British patent), or on August 26, 1911 (with the corresponding German patent), is con-

trary to the decisions of this court in the following, among other cases:

Bate Refrigerating Co. v. Sulzberger, 157 U. S., 18, 26; 39 L. Ed., 601, 608.
Mosler Safe & Lock Co. v. Mosler, Bahmann & Co., 127 U. S., 354; 32 L. Ed., 182.
Miller v. Eagle Mfg. Co., 151 U. S., 186, 197-202; 38 L. Ed., 121, 127-129.
Plummer v. Sargent, 120 U. S., 442; 30 L. Ed., 737, 739.
Giant Powder Co. v. California Powder Works, 98 U. S., 126; 25 L. Ed., 77, 81-82.
Commercial Mfg. Co. v. Fairbank Canning Co., 135 U. S., 176; 34 L. Ed., 88.

FIREBALL GAS TANK & ILLUMINATING COMPANY,
By DAVID LEON SOLOMAN,
President.
DAVID LEON SOLOMAN.
HUGH K. WAGNER,
Counsel for Petitioners.

UNITED STATES OF AMERICA
EASTERN DIVISION OF THE EASTERN JUDICIAL DISTRICT OF MISSOURI
STATE OF MISSOURI
CITY OF ST. LOUIS
} ss.

David Leon Soloman, being duly sworn, on his oath states that he is one of the petitioners in the above-entitled cause and president of the petitioner corporation; that he has read the foregoing petition for writ of *certiorari*, and knows the contents of same; and that the facts therein stated are true, as he verily believes.

DAVID LEON SOLOMAN.

Sworn to and subscribed before me this 11th day of January, 1913.

GLADYS WALTON,
Notary Public.

I hereby certify that I am counsel for the petitioners in this cause and that in my judgment the above petition for *certiorari* is well founded in point of law and fact and ought to be granted.

HUGH K. WAGNER,
Counsel for Petitioners.

IN THE

UNITED STATES CIRCUIT COURT OF APPEALS

FOR THE SEVENTH CIRCUIT.

October Term, 1912. October Session, 1912.

No. 1950.

The Commercial Acetylene Company and Prestolite Company vs. George F. Schroeder, The Searchlight Gas Company and Oscar Bauer.	Appeal from the District Court of the United States for the Northern District of Illinois.

Before BAKER and SEAMAN, *Circuit Judges*, and HUMPHREY, *District Judge*.

HUMPHREY, *District Judge*, delivered the opinion of the Court:

A considerable volume of prior litigation on the patent in suit is to be found in the books, but this is the first case in which the defenses here presented appear to have had the consideration of the Court.

The Court of Appeals of the Sixth Circuit in 192 Fed., 321 held that it would not review the discretion of the court below in following the Milwaukee Court on an application for a preliminary restraining order, but that the question of validity would be open on final hearing; and the Court of Appeals of the Eighth Circuit in *Commercial Acetylene Company et al.* v. *Fireball, etc., Co.*, 198 Fed., 650, held that it was discretionary with the Circuit Court to grant the temporary order, that this discretion was for the Circuit Court and not for the Court of Appeals, but that the question of validity was open for final hearing. The patent in suit is described in claims 1, 2, and 5 as follows:

"1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and *means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure*, substantially as described."

"2. A prepared vessel consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, *the*

package being provided at a point above the solvent with a reducing valve, substantially as and for the purpose set forth."

"5. As a new article of manufacture, a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; *and a reducing valve applied to an opening and extending to the interior of the holder above the level of the solvent,* substantially as set forth."

The defense is first, non-infringement, and second, that the patent expired prior to the suit by reason of the expiration of the British patent substantially identical with the patent in suit. The claims of the British patent are as follows:

"1. The utilization for the purpose of storage, in a small volume of large quantities of acetylene gas, of the solubility of said gas in certain liquids by the application of pressure so as to increase the quantity of gas dissolved per unit of volume of liquid as specified."

"6. The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified."

"7. The herein described method of storing acetylene gas in a small volume for lighting or other purposes, which consists in dissolving the acetylene gas under pressure in a suitable liquid solvent such as described from which it can be evolved when required for use."

The British patent and the patent in suit are for substantially the same invention. The claims and the specifications show this. Both are for storing acetylene. Both describe a receptacle therefor; both are for the distribution of the acetylene and control of such distribution. All distinctions sought to be made are distinctions in terms, in modes of expression, mere descriptive words. The patented invention is the same in both. The British patent having expired the patent in suit expired with it. Complainants contend that this patent is protected by the treaty of 1902 and the Act of Congress of 1903, in relation thereto. The purpose of the Act of 1903 was to lengthen the time after a foreign application before an application at Washington would be barred. It is not conceivable that Congress intended to make this statute retroactive. Any such construction is unwarranted by the words of the statute.

Malignani v. *Hill-Wright Elec. Co.*, 177 Fed., 430.
Same v. *Jasper Marsh Cons. Elec. Co.*, 180 Fed., 442.

So elaborately have all these questions been considered and authorities cited by the trial court no good purpose would be served by repeating them here. 197 Fed., 908.

Respecting infringement, we find that appellees use a needle valve, which is not the equivalent in structure or function of the reduction valve described and claimed in the patent as a material element of the combination.

The decree is

AFFIRMED.

A true Copy.
Teste:

[SEAL]

EDWARD M. HOLLOWAY,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

IN THE

SUPREME COURT OF THE UNITED STATES.

No. 905.

OCTOBER TERM, 1912.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN,
Petitioners,
vs.
COMMERCIAL ACETYLENE COMPANY and THE PREST-O-LITE COMPANY,
Respondents.
In Equity.

BRIEF FOR PETITIONERS.

The petition for rehearing (Record, pages 625-645), will be found an adequate brief in support of this petition for *certiorari*.

Respectfully submitted,

HUGH K. WAGNER,
Counsel for Petitioners.

St. Louis, Missouri, January, 1913.
Suite 503 Fullerton Building.

3

Office Supreme Court, U. S.
FILED
OCT 6 1915
JAMES D. MAHER
CLERK

IN THE

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1915.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN,
Petitioners,
vs.
COMMERCIAL ACETYLENE COMPANY and the PREST-O-LITE COMPANY,
Respondents.

No. [redacted] 18

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE EIGHTH CIRCUIT.

BRIEF FOR PETITIONERS.

[redacted]
Counsel for Petitioners.

INDEX.

	Page
Introduction	1
Acetylene	2
Reducing-valves	3
Henry's law	5
The patent in suit	6
Supersaturated	8
Claims of patent in suit	9
The abandoned method application	10
Relation of apparatus and method applications	12
Complainants' device	13
Defendants' device	14
Prior litigation of patent in suit	14
The defenses	17
Expiration of patent in suit	17
Law on the subject	17
Identity of inventions	17
The Leeds and Catlin case	19
The rules of double patenting	22
The rules as to limitation of United States by foreign patents	24
The foreign patents of Claude and Hess	24
British patent to Claude and Hess	24
The British patent as a method patent	26
German patent to Claude and Hess	35
French patent to Claude and Hess	38
Commercial Company v. Acme Company decisions	40
Commercial Company v. Searchlight Company decisions	41
Anticipation of patent in suit	43
The prior art	43
German patent to Webb	43

Journal of Franklin Institute..... 44
British patent to Gearing..... 44
German patent to Loesner..... 44
Henry's Law 44
Unpatentable combinations 46
Combinations and aggregations..... 49
Known conditions of prior art..... 51
Doctrine of double use..... 51
Why gas tank was not developed prior to patent.. 54
Extensive sales 55
Essence of invention added by amendment..... 57
Defendants do not infringe..... 58
Analysis of claims of patent in suit..... 58
Definitions of reducing-valves..... 58
Restriction of invention during prosecution..... 61
Needle valve not a regulating valve..... 64
Outlet above solvent..... 65
Defendants use new solvent..... 66
Comparative properties of acetone and terpeline. 67
Defendants' patent 68
Decision of Circuit Court of Appeals, Eighth Circuit 69
Dismissal of bill at hearing..... 70
Conclusion 70

IN THE

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1914.

FIREBALL GAS TANK & ILLUMINATING COMPANY and DAVID LEON SOLOMAN,
Petitioners,
vs.
COMMERCIAL ACETYLENE COMPANY and the PREST-O-LITE COMPANY,
Respondents.
No. 89.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE EIGHTH CIRCUIT.

BRIEF FOR PETITIONERS.

This is an equity suit brought by complainants-respondents against defendants-petitioners to enjoin the infringement of United States Patent Number 664,383, granted December 25, 1900, for "Apparatus for Storing and Distributing Acetylene Gas". Complainants-respondents are respectively the owner of the patent and the exclusive licensee as to the use of the invention on automobiles, carriages and other movable vehicles. Defendant-petitioner, Fireball Gas Tank & Illuminating Company, manufactures and sells what is known as the "Fireball Gas Tank"; David Leon Soloman is the president of that corporation.

The bill of complaint was filed August 17, 1911. Upon an order to show cause why a premilinary injunction should not issue defendants filed with their return affidavits and exhibits which constitute, together with the bill, answer, replication, and the affidavits and exhibits of complainants-respondents, the complete record in this case. After argument upon motion for preliminary injunction the Circuit Court granted an order for a preliminary injunction. Defendants-petitioners appealed from this order to the Circuit Court of Appeals, which court affirmed the decision of the Circuit Court and denied a motion for rehearing. The petition for writ of *certiorari* was then filed, and the *certiorari* and return were filed on March 7, 1913.

ACETYLENE.

Since the patent relates to "Apparatus for Storing and Distributing Acetylene Gas", it will be advantageous to preliminarily consider the properties of this gas.

A good discussion of the manufacture, properties and uses of acetylene is found in an article in the Journal of the Franklin Institute for January-June, 1895, which article is reproduced on pages 223-238 of the record as Defendants' Exhibit No. 5. It is to be noted that this article was published nearly two years prior to the date of filing (March 1, 1897) of the application which matured into the patent in suit, the patent in suit being found opposite page 426 of the record. We will briefly summarize this article.

Acetylene is a gaseous compound comprising carbon and hydrogen, and having the chemical formula C_2H_2. It is produced commercially by the action of water upon calcium carbide. Although acetylene was discovered by Sir Humphrey Davy nearly one hundred years ago, it was not developed commercially until Wilson developed a method whereby calcium carbide could be produced economically and in such a form that acetylene could be produced for commercial use. Wilson started his experiments in 1888 and completed the same in the 90's, his patent being granted on June 18, 1895. It is to be noted that this patent was in litigation in the case of Union Carbide Company v. American Carbide Company, 181 Fed. 104. This decision also contains a brief history of acetylene and calcium carbide.

Acetylene has a number of characteristic properties which are, however, common to many gases. It has the gaseous, liquid and solid forms, depending upon the temperature. It may, therefore, be condensed to a liquid, but this requires about forty atmospheres at a temperature of 67° F. Since

liquid acetylene, therefore, boils at 67° F., it will, if kept in a container in liquid form, boil and vaporize at ordinary room temperature. It is soluble in different liquids, thus it is soluble in water, and also in *alcohol*. As to alcohol, it is to be noted that one volume of alcohol dissolves about six volumes of acetylene.

There are two general systems of using acetylene. In one of these, illustrated opposite page 236, the gas is used directly from the generator, in which water is dropped upon carbide and the gas stored in a tank from which it is conducted to the burners. In another system of distribution, shown opposite page 237, the gas produced from the carbide is condensed to a liquid form and placed in a small tank. The gas, as vaporized, is conducted to the burners. In view of the fact, however, that the gas is under forty atmospheres pressure, or six hundred pounds per square inch, the pressure of the gas must be reduced. A *reducing valve* is, therefore, used in connection with this tank, which reducing valve reduces the pressure from forty atmospheres to the pressure given by a column of water two inches high.

REDUCING-VALVES.

As noted above, the pressure at the burners is low. Thus, in the instance just given, it is that of a column of water two inches high, which corresponds to about one ounce pressure per square inch. If we take gas from a source of supply under pressure, say from the ordinary city supply, the more we open the valve or cock at the gas jet, the higher the flame will be. The valve is for the purpose of throttling the gas, and when we turn on a gas jet by throttling we regulate the pressure at the jet, and, therefore, the height of the flame. Now, with a given valve opening, *the pressure at the burners will depend upon the pressure of the gas as delivered by the source of supply*, and if the pressure at the source of supply should drop, the pressure at the burners will drop accordingly. A good illustration of this is in the gas piping of an ordinary residence having the meter in the basement. If the gas is turned off at the meter there remains, of course, a certain amount of gas in the pipe connections leading from the meter to the burners, and the lights will *gardually die out*. At the instant of turning off the gas the gas at the burner valves is at full pressure, but as the gas in the pipes is used up, the pressure at the burners will gradually drop with the pressure in the pipes, and the lights will gradually die out. It is, of course, self-evident that the rate at which the lights will die out will de-

pend upon the *relative volume* of the pipes, the number of burners, and the amount the cock or valve is open at each burner.

If now we take a tank full of gas at high pressure, say two hundred pounds per square inch, and set the valve at a certain point to get a flame of a certain height, the flame will die down *gradually* as the gas in the tank is used up, and, therefore, as the pressure in the tank drops. Of course, the *rate* at which the flame will die out will depend upon the amount of gas, and, therefore, on the pressure in the tank, and the rate of use at the burners. Thus, if we take a tank having an initial gas pressure of two hundred pounds per square inch, and a burner taking gas, by throttling, at one ounce per square inch, then there is a relation of 3200 to 1. A drop of the pressure in the tank of ten per cent, that is, from two hundred to one hundred eighty pounds, will cause a corresponding drop at the burners. Of course, a ten per cent drop at the burner will not be very noticeable. If, however, we take a large house with, say, a gas tank having a capacity for two evenings' supply, with all the burners taking gas, then at the end of the evening the *jet flame will only be one-half* of the height that it was at the beginning. Of course, this might be taken care of by adjusting each gas jet, or by adjusting the valve between the tank and the pipes leading to the burners, several times during the evening, but that is inconvenient.

In order to overcome this objectionable feature, there has been devised a valve known as a "*reducing valve*" or "regulating valve", which will *automatically adjust itself to give a uniform and correct pressure at the burners, even if the pressure at the source of supply does vary materially.* An illustration of a reducing valve well known prior to the application for the patent in suit is illustrated by German patent to Webb, No. 58,927, published September 21, 1891, and the drawing of which is inserted at page 318 of the record. In this patent a tank A containing gas under high pressure supplies a burner L through a pipe p^1. The tank is provided with a manually operated valve B, and with a "reducing valve" V. The gas enters this reducing valve at *s*, the entrance to the valve casing being controlled by a throttle valve *q*, while the gas leaves the valve at *r*. The throttle valve *q* is carried by lazy tongs *n* supported, intermediate their ends, from a bracket b^1. The other end of the lazy tongs is connected with a diaphragm *e* in turn connected by the corrugated valve *m* to the valve casing. Let us suppose that the valve *q* has opened the inlet to the valve casing a certain amount, so that the gas will be throttled a certain amount. If the gas pressure within the box framed

by the diaphragm *e* and the sides *m* should rise, then the valve *q* will be closed to throttle the gas still more until a balance is established. Of course, the reverse action takes place if the gas pressure at the source of supply should drop. With this *reducing-valve*, therefore, the *pressure of the gas delivered by the valve will remain uniform or constant, irrespective of variations of pressure at the source of supply.*

HENRY'S LAW.

We have referred above to the fact that acetylene is soluble in water and in alcohol. Now the absorption by or the *solution of gases in liquids has long been a known characteristic.* As stated by defendants' expert, Mr. Hills (R. 35-36):

> "Any one not a chemist might not know that a gas can be dissolved in a liquid. Nevertheless, it is well known that such is the fact. Just as sugar can be dissolved in coffee and just as many solids can be dissolved in water and just as nearly all solids can be dissolved in liquids (the appropriate liquid or liquids being used for each particular kind of solid), so, also, can gases be dissolved in liquids. The solubility of gases in liquids has been known for a very long time, and so early as 1803 an eminent English chemist named William Henry announced the further discovery that the quantity of gas that any liquid will dissolve depends upon the amount of pressure to which the gas is subjected. This principle appertaining to the solubility of gases in liquids is known as 'Henry's Law', and statements of it are found spread broadcast through the encyclopedias and other literature of the subject. For instance, 'The New International Encyclopedia', published in 1903 by Dodd, Mead & Company, of New York, states it in the following very clear and brief form:
>
> " 'The amount of any gas absorbed by any liquid is proportioned to the pressure exercised upon the gas.' "

The laws of solubility of gases in liquids are well stated in Watts' Dictionary of Chemistry, published in 1875, and an extract from which is inserted on page 302 of the record, as follows:

> "The amount of a gas absorbed by a liquid upon which it exerts no direct chemical action is dependent: (1) in the specific nature of the gas and of the liquid; (2) on the temperature at which the absorption takes place; (3) on the pressure under which the absorption takes place."

This is applied practically to the preparation of carbonated waters, as is illustrated in the ordinary soda fountain, and in the selzer or Woulff bottle. The preparation of carbonated waters is fully described in an extract from a Treatise on Beverages by Sulz, published in 1888 and found on pages 306-308 of the Record. Carbonated water consists of a solution of carbonic acid gas in water, and, as stated on page 307 of the Record, the amount of carbonic acid gas which water will dissolve increases with the pressure. Thus, at one atmosphere pressure water will absorb its own volume of the gas, at two atmospheres two volumes, etc. Of course, in any soda water fountain tank there is a certain amount of free gas above the liquid, and, if some of this gas is allowed to escape, a certain amount of the gas absorbed by the liquid is set free, on account of the decrease in pressure, so as to fill the space above the liquid. At ordinary pressure all of the gas will have escaped from the liquid except that part of the gas which remains in the liquid at atmospheric pressure.

THE PATENT IN SUIT.

The patent, a copy of which is inserted at page 426 of the Record, is entitled "Apparatus for Storing and Distributing Acetylene Gas". The specification describes the nature of the invention as follows:

> "This invention pertains to apparatus for the storage and distribution of acetylene gas, and is designed to *carry out a process of storage and distribution* involving the employment of a chamber charged with a solvent of the gas to be stored and into which the gas is forced under suitable pressure. The apparatus is to be charged or prepared at a central station or distributing-point and shipped or transported to the intended place of use as a complete article or 'package' adapted to be placed in communication with the burners or pipes of a building, room, or space to be lighted or heated." (Lines 12-25, p. 1; italics ours.)

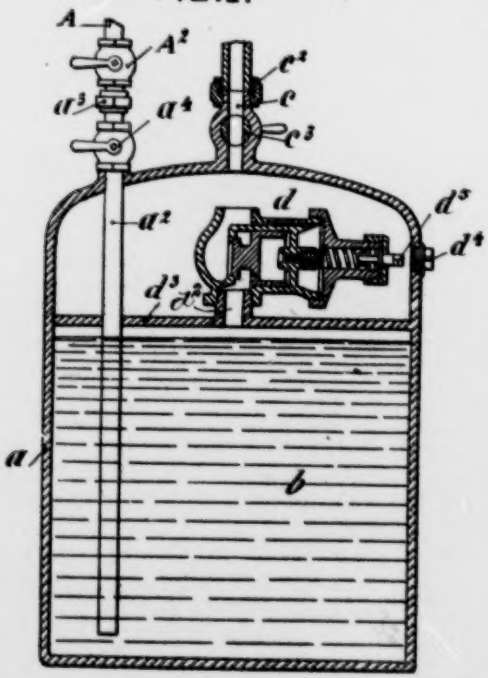
The invention is stated as follows:

> "To this end the apparatus embodying the present invention consists, essentially, in a closed receptacle containing acetylene gas in solution and having an outlet for the gas so positioned as to be *normally above the level* of said solution and adapted to be provided with a burner or connected with a pipe system for the final use or distribution of the gas which escapes from the solution owing to the diminution of pressure when the said outlet is opened. (Specification lines 26 to 36, italics ours.)

* * * It is further desirable for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a *substantially uniform pressure* only slightly above the atmospheric pressure, and for this purpose means are provided for controlling the outlet whereby the gas is allowed to escape therethrough at *substantially uniform pressure*, a *reducing-valve* being herein shown as interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which said gas is allowed to escape for use." (Lines 50 to 63, italics ours.)

The drawings show two figures, but it is only necessary to consider one, namely, Figure 1, which is here reproduced. Referring to this figure, the apparatus comprises a receptacle or tank *a* containing a cross-partition b^3 dividing the receptacle into a solvent space filled with a fluid *b*, "such as alcohol or acetone, capable of dissolving acetylene gas", and above with a gas space. A gas charging or inlet pipe A, provided with suitable valves, extends to the bottom of the receptacle, while a gas outlet pipe *c* opens from the gas space *above the level of the solvent* and is provided with a valve c^3.

FIG. 1.



If the receptacle is charged with the acetylene solvent, such as alcohol or acetone, and this solvent has acetylene dissolved therein under high pressure, such as twelve atmospheres, or about one hundred and eighty pounds per square inch, this gas can, of course, escape through the outlet pipe *c* connected with the burners, if the valve c^3 is opened. It is obvious, of course, that, if only the valve c^3 were provided, and if this valve were set so as to obtain the right pressure at the burners, which in practice is only a small fraction of a pound per square inch, then, as the gas would be used up, the pressure in the tank would, of course, decrease from the maximum pressure when full, to the minimum pressure when empty. Now, this decrease of the pressure inside of the tank would of course, cause a proportional decrease of the gas pressure at the burners, as is well illustrated by the diagram of complainants' expert Gallagher, inserted on page 449 of the Record. The two extremes illustrate the decrease of the pressure at the burners, and, therefore, of the size of the flame, by a decrease of the pressure in the tank from two hundred three pounds per square inch to one hundred one pounds per square inch. It will, therefore, be obvious that the provision of a simple *manually operable* valve would cause a *continual decrease* in the pressure at the burners as the gas in the tank is used up. The patentees appreciate this, and, therefore, provide *additional and special means* for taking care of this condition, which additional means is described as follows:

> "In order that the gas delivered from the receptacle may pass into the pipes to the burners under a *substantially uniform pressure* (the pressure of the gas within the receiver of course *decreasing* as the gas passes out therefrom), a *reducing-valve* of any suitable or *usual construction* is interposed between the interior of the receptacle and the outlet *c* therefrom." (Specification, p. 1; lines 92-100, italics ours.) * * * "It is obvious that through the agency of the *reducing-valve* the pressure in said upper reservoir will be *substantially uniform*, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is *fully charged* as when it is nearly exhausted." (Specification, p. 2; lines 13-20, italics ours.)

Supersaturated.

In the specification of the patent in suit appears the term "supersaturated". We can do no better than to adopt the definition given by the attorneys of the patentees during the

prosecution of the application which matured into the patent in suit (Record 418):

> "If the solvent contains only so much gas as it will dissolve at atmospheric pressure, or in the absence of special and artificial pressure, it becomes a saturated solution. If pressure is applied it becomes, of course, a supersaturated solution, because it contains more than will remain in a state of solution if the pressure be removed, although many times the volume of the solvent will so remain dissolved when the pressure *is* removed. Hence, when the expression 'acetylene dissolved in and held by said solvent under pressure' is employed it necessarily implies and clearly means a supersaturated solution."

Claims of Patent in Suit.

The claims alleged to be infringed are claims 1, 2 and 5 of the patent, which read as follows. (Italics ours):

> "1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, *and means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure*, substantially as described.
>
> "2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided *at a point above the solvent* with a *reducing-valve*, substantially as and for the purpose set forth.
>
> "5. As a new article of manufacture, a gas-package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent, and *a reducing valve applied* to an opening extending to the interior of the holder *above the level of the solvent*, substantially as set forth."

The application which matured into the patent was filed on March 1, 1897, and the file wrapper constitutes pages 387 to 429 of the record, the same being Defendants' Exhibit No. 39.

THE ABANDONED METHOD APPLICATION.

On the same day that the application which matured into the patent was filed, Claude and Hess filed an application for "Improvement in Method of Storing Acetylene Gas for Distribution". This application, however, never matured into a patent. The file wrapper of this application, together with the appeal records, are Defendants' Exhibits Nos. 9, 10 and 11, and constitute pages 257 to 301 of the record.

The nature of the invention of this method application is stated as follows (Rec., p. 260):

> "The present invention relates to a method of storing acetylene gas for distribution in order that the gas may be stored in suitable receptacles and delivered to the consumers, the object being to provide means whereby a large quantity of gas can be stored with safety in a comparatively small receptacle so that renewals need not be too frequently made."

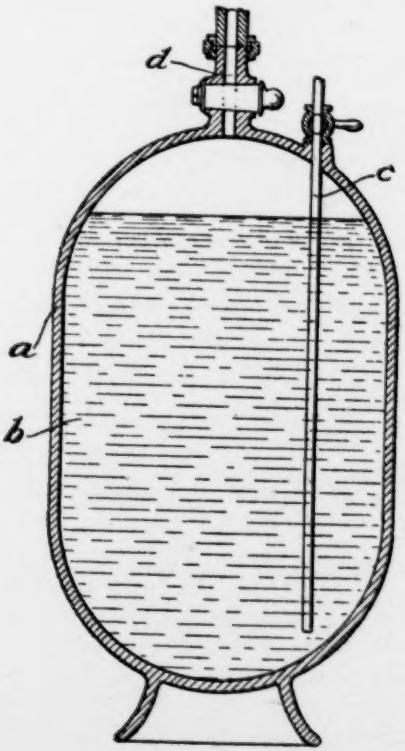
The objects and the features of the invention are stated in this application as follows (Rec., p. 261):

> "The object of the present invention is to provide means for distributing the gas in holders without reducing the same to a liquid by direct compression, although providing for the storage of a large quantity of the gas in a small place without encountering dangerous pressures or pressures which are liable to be suddenly increased to an enormous degree by an increase in temperature or other causes. In carrying out the invention, a suitable receptacle is provided for the gas, having a *faucet or coupling* for applying the same to a system of pipes used at the place of consumption or any suitable means for delivering the gas for consumption, and said receptacle is supplied with a liquid capable of dissolving acetylene gas, it having been found that the different *alcohols* and several other liquids are capable of dissolving many times their volume of acetylene under ordinary pressure, within the limits of practical use, the increase being substantially in direct proportion to the increase in pressures." (Italics ours.)

With this application was filed a drawing, which is here reproduced, as showing an apparatus for carrying out the method. The specification describes the apparatus as follows (Rec., p. 262):

"To illustrate the process, reference may be had to the accompanying drawing, in which the receptacle a is supplied with a liquid solvent of acetylene indicated by the letter b and provided with an inlet pipe c opening below the surface of the liquid so that gas introduced will pass through and be dissolved in the liquid during the charging process.

"*The receptacle is provided with a gas outlet* d above the surface of the liquid from which the gas is to be taken for consumption." (Italics ours.)



The original method claims are found on pages 263 of the record.

It is to be noted that both the inlet and the outlet have a *valve*, as clearly shown in the drawing, and that the outlet d has "*a faucet or coupling for applying the same to a system of pipes used at the place of consumption.*"

Relation of Apparatus and Method Applications.

The sole difference between the tank or receptacle as shown in this method application, and that shown in the apparatus application which matured into the patent, is that, in the apparatus application there is provided a *reducing-valve*, by means of which, as stated in the patent, *"the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted"*.

The two applications contain cross-references one to the other, the cross-reference in the method application being found on page 262, and in the apparatus application as originally filed on page 389, of the record.

The Patent Office rejected the method application, and the applicants took successive appeals to the Board of Examiners-in-Chief and to the Commissioner of Patents.

In the application as presented upon the second appeal to the Board of Examiners-in-Chief, the claims specify that the discharge of the gas through the outlet passage is *"controlled by and proportionate to the pressure of the gas within the holder"*, and the attorney argued in his brief that he should be allowed to introduce into the case and illustrate in the drawings an *"automatic regulating valve"*, *"since the reducing-valve or some equivalent thereof is contemplated in the claims in this"* (Rec., p. 296). The Commissioner, however, refused this on the ground that it would involve a *departure from the original disclosure* (Rec., p. 300).

METHOD WAS HELD BY PATENT OFFICE TO BE FOR FUNCTION OF APPARATUS.

The Commissioner, in refusing the allowance of the claims as being disclosed in the prior art, and as being for unpatentable subject-matter as method claims, speaks as follows (Rec., p. 300):

> "It appears, further, that they *do not cover proper methods*, but merely the *functions of mechanism* and that they are not patentable in view of the decisions in Cochrane v. Deener, 94 U. S. 780, and Boyden Brake Co. v. Westinghouse, 83 O. G. 1067. Claim 3 clearly covers several independent (independent) disconnected steps which do not go to make up a patentable process." (Italics ours.)

No appeal was taken from the decision of the Commissioner

and the application, therefore, became abandoned (Rec., p. 294).

It will, therefore, be noted that the applicants sought protection for two things, namely, for a *method* in one application and for an *apparatus* in another application. The apparatus was allowed and the patent in suit issued for the same. A patent was, however, refused for the method, one of the grounds being that the method was merely for the *function of the mechanism.* It is very important to keep this matter in mind, since it has considerable bearing upon the question of whether the patent in suit expired with foreign patents granted to Claude and Hess, as will appear later.

COMPLAINANTS' DEVICE—PREST-O-LITE GAS TANK.

One of the tanks as now used by complainants-respondents is now in evidence, and a drawing is inserted opposite record page 60 as "Defendants' Exhibit No. 1". The device comprises a steel tank having a *porous filler of asbestos* containing the solvent for acetylene, complainants' tanks using acetone. The tank is equipped with an outlet c, which has a valve c^3 known as a *needle valve,* and which is *hand-operated.* Now this tank has the following charactertistics: It will be noted that the tank bears the designation "THIS SIDE UP", showing in what position the tank is to be placed when in use. The *outlet* c is, therefore, *at the top* of the tank following the directions given in the patent in suit, namely, that this "*outlet for the gas (is) so positioned as to be normally above the level of said solution*". The tank now has a porous filler of asbestos, which is not provided in the tank of the patent in suit. Instead of a reducing-valve through the agency of which, as stated in the patent:

> "The pressure in said upper reservoir will be *substantially uniform,* so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is *fully charged* as when it is nearly exhausted." (Specification, page 2, lines 15-20; italics ours.)

there is used a *manually* operated valve which is set by hand, and whereby the pressure outside of the tank or at the burners will *drop in accordance with the pressure inside,* as hereinbefore described, and as shown in the diagram opposite page 448 of the record.

DEFENDANTS' DEVICE—FIREBALL GAS TANK.

One of the tanks as now used by defendants-petitioners is now in evidence, and a drawing of the same is shown opposite record page 61, "Defendants' Exhibit No. 2". The device comprises a tank 4 which, however, contains a *new acetylene solvent*, namely, "*Terpeline*". The outlet is shown at 1 at the *center* of the tank. The *valve forms the subject-matter of defendants' patent* number 987,000, which is inserted opposite page 430 of the record, and forms "Defendants' Exhibit Defendants' Patent". The valve comprises generally a *needle* 8 co-operating with a stem 21 on a yoke 13, which stem is operated by a hand wheel 24, and which yoke is removably clamped on the outlet 1. It will be noted that this tank has the following characteristics: The *outlet is at the center* of the tank, and not near the top, and it will be further noted that the tank bears *no* designation "THIS SIDE UP". The tank contains a *new acetylene solvent*, namely, "Terpeline", which is *neither alcohol nor acetone*, and, as will appear later, *it is the provision of this new solvent which permits the outlet to be positioned anywhere on the tank*, and it is not necessary to place this outlet at or near the top. The valve is a *new structure*, forming the subject-matter of a patent. It is *not a reducing-valve*, and it is *not* constructed so that

> "the pressure in said upper reservoir will be *substantially uniform*, so that the supply of gas in the pipes is properly controlled, the pressure being substantially the same when the receptacle is *fully charged* as when it is nearly exhausted,"

but it is a *manually* operable valve which, when set, causes the pressure at the burners to *decrease in accordance with the pressure in the tank*, so that the gas does not "escape therethrough at a substantially uniform pressure". This is clearly evident from the diagram opposite page 448 of the record, which is a diagram of the operation of defendants' tank, as made by complainants' expert.

PRIOR LITIGATION OF PATENT IN SUIT.

The first suit which involved this patent was the case of Commercial Acetylene Company v. Avery Portable Lighting Company, the opinion of which is reported in 166 Fed. 907 (C. C. Wis.). The infringing device in that case was the Avery gas tank, which was substantially the same as the Prest-O-Lite tank shown in "Defendants' Exhibit No. 1",

and which had a *needle valve* controlling the outlet of the gas from the tank.

Judge Quarles, who rendered the opinion in that case, seems to base his entire opinion as to the patentability on the fact *that the discovery of the solution of acetylene in acetone formed the basis of the invention,* and was necessary for the conception of the invention, and reading of the whole opinion shows that the *Court considered the provision of a regulating valve or the delivery of gas from the tank at a uniform pressure merely as an incidental feature, rather than as an essential element or feature of what was protected by the patent.* This clearly appears on page 916, where the Judge speaks as follows:

> "What is the pith of this invention? It is to furnish means to store compactly and transport safely acetylene gas for illuminating purposes. The novelty consists in employing a solvent which has the wonderful properties and advantages that have been rehearsed."
>
> * * * * * * * * *
>
> "In such a package there must necessarily be an inlet and outlet. But the inventive thought was not concerned with the specific structure of the outlet valve. It was obvious that by some means the enormous pressure within the tank should be reduced so as to sustain a steady flame at the burner."

And in another part of the opinion, where he speaks as follows:

> "In concluding the discussion on the question of patentability we may state concisely what Claude & Hess have accomplished by their discovery:
>
> "First. By equipping the gas package with acetone as a solvent, they have enormously increased the storing capacity of the tank, rendering it possible to store under moderate pressure 300 times as much acetylene gas as could otherwise be compressed therein. Second. They have disclosed the chemical changes that take place in both gas and liquid when so combined, which render both innocuous and capable of safe transportation. These two features of the discovery clearly entitle the invention to protection."

Although we can hardly say that the Court considered the patent as for a method or a process, it nevertheless appears from the opinion that the Court considered the apparatus

inseparably connected with the method. Thus, on page 911, the Court speaks as follows:

> "In short, Claude and Hess were the first to discover a practical and safe *method* of storing and transporting these dangerous substances—a consumption long sought and one of transcendent importance." (Italics ours.)

The Court accordingly held that a needle-valve was the equivalent of a reducing-valve, and that this needle-valve constituted "means for controlling said outlet whereby the gas may escape therethrough at substantially *uniform* pressure."

It is important to keep these two points in mind, namely, first, a tendency of the Court to consider the claims of the patent at least for *quasi-method* claims, and, second, *disregarding* the provisions of a *reducing-valve as an essential element* of the structure, as this has considerable bearing on the construction of the patent, and of the claims as far as the *identity of the invention* patented in the United States compares to the identity of the invention patented in certain foreign patents of Claude and Hess.

The decision in the above case was followed by the courts in the cases of Commercial Acetylene Co. v. Autolux Mfg. Co., 181 Fed. 387 (same Circuit); Commercial Acetylene Co. v. Acme Acetylene Appliance Co., 188 Fed. 89 (C. C. Michigan), which decision was affirmed by the Circuit Court of Appeals of the Sixth Circuit in 192 Fed. 321, and in Commercial Acetylene Co. v. Widrig & Robinson, 190 Fed. 201 (C. C. Michigan). In the case of Commercial Acetylene Co. *et al.* v. Searchlight Gas Co. *et al.* (C. C. Illinois), the patent was held to expire both on a motion for preliminary injunction, 188 Fed. 85, and on final hearing, 197 Fed. 908, and this decision was affirmed by the Circuit Court of Appeals of the Seventh Circuit, 203 Fed. 276. The Circuit Court in this latter case also questioned the validity of the patent on the ground of anticipation, and both the Circuit Court and the Circuit Court of Appeals, furthermore, found non-infringement. The alleged infringing device embodied a needle valve and was in all respects identical with the Prest-O-Lite tank illustrated in "Defendants' Exhibit No. 1".

THE DEFENSES.

The main defenses in this case are three in number.
I. That the patent has expired.
II. That the patent is void.
III. That the defendants do no infringe the patent.

THE EXPIRATION OF THE PATENT IN SUIT.

The Law on the Subject of Expiration of United States Patents With Foreign Patents.

Section 4887 of the Revised Statutes, prior to its revision, effective January 1, 1898, provided that

> "every patent granted for an invention which has been *previously patented* in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years." (Italics ours.)

When this case was decided by the Circuit Court of Appeals, the question of whether the above provision of section 4887 applied to patents granted after January 1, 1898, on applications filed before that date, had not been decided by this court. This question has, however, now been definitely settled in the affirmative by this court in Cameron Septic Tank Co. v. The City of Knoxville, 227 U. S. 39. The sole question, therefore, left in this case is one of *identity of invention,* that is, whether or not the invention of the United States patent was "*previously patented*" in a foreign country.

Identity of Inventions.

The leading cases of this court upon the questions of identity of inventions are the following:

Siemens v. Sellers, 123 U. S. 276;
Commercial Mfg. Co. v. Fairbanks, 135 U. S. 176;
Bate Refrigerating Co. v. Sulzenberger, 157 U. S. 1;
Leeds & Catlin Co. v. Victor Co., 213 U. S. 301.

The case of *Siemens v. Sellers* contains a complete history of section 4887 up to and including the Act of 1870. The patent in that case came under the Act of 1839, by which the term of a United States patent was limited for fourteen years from the date of publication of the foreign patent. The question of

identity of invention is, however, the same under both acts, so that the case applies. In that case the patent in suit was the Siemens Regenerative Furnace, and the question for the consideration of the court was whether this patent was limited by a British patent to Siemens. The United States patent contained four claims, while the British patent only contained one. The Court, however, held that the British patent covered the same subject-matter as the United States patent. It was argued that the United States patent contained *improvements* not found in the British patent. The Court, however, in disposing of this point speaks as follows:

> "It is contended by the counsel of the complainants, that the *American patent contains improvements* which are not exhibited in the English patent. But if this were so, it would not help the complainants. *The principal invention is in both;* and if the American patent contains additional improvements, this fact cannot save the patent from the operation of the law which is invoked, if it is subject to that law at all. A patent cannot be exempted from the operation of the law by adding some new improvements to the invention; and cannot be construed as running partly from one date and partly from another. This would be productive of endless confusion." (Italics ours.)

In *Commercial Mfg. Co. v. Fairbanks*, the patent sued upon was the Mege patent for oleomargarine and the process of producing the same, the title being "Improvement in Treating Animal Fats". The United States patent contained *two* claims, one for the *article* made by the process, and the other for the *process* of producing the article. A Bavarian patent and an Austrian patent were for the *process*, and each contained only *one* claim, namely, for the process. The plaintiffs in that case contended that the United States patent distinguished from the foreign patents in that certain steps were *not definitely described* in the foreign patents, and that the foreign patents were, therefore, not for the same invention as the United States patent. The Court, however, quotes with approval from the decision of the Circuit Court on this point, which holds that the differences were mere *differences in degree,* and such as would be *obvious to any skilled artisan* in that art from a knowledge of the processes as described in the foreign patents. The Court lays down the test as to identity of patents as follows:

> "A fair test of the question as to whether the American

patent is anticipated by the foreign patents, or is included in them, we think would be: Were a person in this country, after the issue of the present American patent, to commence the manufacture of oleomargarine by the precise process described in the Bavarian or Austrian patents, supposing that process had not been patented abroad, would the courts refuse an injunction to restrain the use of the process on the ground that it infringed that covered by the American patent? We can hardly deem it possible that any intelligent court would deny an injunction if applied for under such circumstances, and we think this fairly illustrates the relation of the foreign to the American patent."

The case of Bate Refrigerating Co. v. Sulzenberger contains a full history of the Patent Acts, more especially of section 4887, from 1790 to 1874, the time of the adoption of the section as now under consideration, and reviews all the decisions on this point.

THE LEEDS AND CATLIN CASE.

The case of *Leeds & Catlin Co. v. Victor Co.* is much relied upon by respondents as sustaining their side, and it is contended by counsel for respondents that this decision materially modifies the previous decisions of Siemens v. Sellers and Commercial Mfg. Co. v. Fairbanks. Upon closer examination, however, it will be found that this decision is entirely in accord with the prior decisions *as to the principles involved.*

The question involved in this case was whether the United States patent for a method and apparatus for reproducing speech was limited by a foreign patent for the reproducer, which simply formed an element of the combination apparatus.

The Court approves the statement from Siemens v. Sellers that it is sufficient if *"the principal invention is in both"*. This the Court construes as that which performs *"the same function in all particulars"*. Of course, an improvement which changed the *essence or the identity* of the entire invention would not make it the same as the foreign patent.

The Court especially approves the statement from Bate Refrigerating Co. v. Sulzenberger as to the policy of section 4887 that an American patent is granted upon the condition that the

> "*invention* shall be free to the American people whenever by reason of the expiration of the foreign patent it becomes free to the people abroad."

Respondents place great reliance upon the following statement by the Court on the question of identity of inventions:

> "Besides, a patent may embrace more than one invention. (Steinmetz v. Allen, 192 U. S. 543.) A process and an apparatus by which it is performed are distinct things. They may be found in one patent; they may be made the subject of different patents. So many other *dependent and related* inventions. If patented *separately* a foreign patent for either would not affect the other. Why would such effect follow if they are embraced in the same patent? What policy of the law would be subserved by it? The purpose of Section 4887 of the Revised Statutes is very clear. *It is that whenever an invention is made free to the public of a foreign country it shall be free in this.* The statute has no other purpose. It is not intended to confound rights and to make one invention free because another is made so." (Italics ours.)

THE LEEDS AND CATLIN CASE DOES NOT DECIDE THAT A U. S. PATENT FOR AN APPARATUS WILL NEVER BE LIMITED BY A FOREIGN PATENT FOR A METHOD, OR VICE VERSA.

This they (respondents) construe to mean that a United States patent for an apparatus will *never* be limited by a foreign patent for a process or method, or *vice versa*. As will, however, be seen, the decision cannot be given such construction.

The case of Steinmetz v. Allen was a case involving the validity of a Patent Office rule requiring separate applications for a process and apparatus. The Court there had to specifically decide *whether a process and apparatus are always independent*, or whether they may be so connected in their design and operation as to be for the same purpose and auxiliary to the same common end. The Court, in discussing this point, speaks as follows:

> "Can it be said that a process and an apparatus are inevitably so independent as never to be *'connected in their design and operation?'* They may be completely independent. (Cochrane v. Deener, 94 U. S. 780.) But they may be related. They may approach each other so nearly that it will be difficult to distinguish the process from the *function of the apparatus*. In such case the apparatus would be the dominant thing. But the dominance may be reversed and the process carry an exclusive right,

no matter what apparatus may be devised to perform it." (Italics ours.)

The Court points out that there may in some cases be danger of invalidation by *double patenting* when it refers to the case of James v. Campbell, 104 U. S. 356, as follows:

> "The case, however, indicates what embarrassment and peril of rights may be caused by a hard and fixed rule regarding the separation of related inventions. See also Mosler Safe Co. v. Mosler (127 U. S. 354) and Miller v. Eagle Manufacturing Co. (151 U. S. 186)."

It is to be noted that the cases referred to are cases of double patenting. In the first mentioned case the Court says:

> "After a patent is granted for *an article described as made by causing it to pass through a certain method of operation to produce it*, as, in this case, cutting away the metal in a certain manner and then bending what is left in a certain manner, the inventor cannot afterwards, on an independent application, secure a patent for the method or process of cutting away the metal and then bending it so as to produce the identical article covered by the previous patent, which article was described in that patent as produced by the method or process sought to be covered by taking out the second patent." (Italics ours.)

THE LEEDS AND CATLIN CASE DOES NOT APPLY TO RELATED INVENTIONS, BUT STEINMETZ V. ALLEN CONTROLS.

It will thus be seen that, in the case of Steinmetz v. Allen, the Patent Office rule was held invalid *because it required distinct applications for the process and apparatus, on the ground that such a division of the invention into two patents might cause one to become invalid on the ground of double patenting.* This decision was approved in the Leeds & Catlin case, and the statement in that case, including the decision of Steinmetz v. Allen, must, therefore, be *construed in connection with that decision.*

When, therefore, the Court says, in the Leeds & Catlin case, that "a process and an apparatus by which it *may* be performed are distinct things" it must refer to the same as different *classes* within the meaning of section 4886. It cannot mean that they can never be so "connected in their design and operation" that they constitute one inventive act,

and cannot, therefore, be independent, or that a patent granted for one could not bar a patent for the other. That the Court considered only *independent* inventions is seen from the statement of the Court that "a method is independent of the instruments employed to perform it." It could not include those methods considered in Steinmetz v. Allen as so "connected in their design and operation" and approaching "each other so nearly that it will be difficult to distinguish the process from the function of the apparatus."

THE LIMITATION OF AN APPARATUS PATENT BY A METHOD PATENT, OR VICE VERSA, WAS NOT NECESSARY FOR THE DECISION IN THE LEEDS AND CATLIN CASE.

It is to be noted that the specific point whether the United States patent for an apparatus and a foreign patent for a process *involving the operation of the apparatus* are for the same invention was not necessary for the decision in the Leeds & Catlin case. As noted above, the United States patent contained claims one for a complete talking machine (a *combination apparatus* claim) and the other for a method of reproducing speech (a *combination method* claim involving the operation of the apparatus). The foreign patent was for the *reproducer per se*, which was *merely an element* of the complete talking machine, and only performed an *elemental function* in the combination process or method. Of course, an element is never for the same invention as the combination of which it forms a part, whether we take the combination as an apparatus, or as a process, and whether we take the element as a mechanical integer or a means performing an elemental function or step in the process or method. The decision would probably have been entirely different if claim 5 for the combination method and claim 35 for the combination process had been in separate patents.

THE RULES OF DOUBLE PATENTING APPLY.

The question of limitation of United States patents by foreign patents involves a question of *identity of invention*. The rules as to *double patenting*, therefore, apply. Sawyer Spindle Co. v. Carpenter, 133 Fed. 238.

Now, as noted above, this Court has held that the necessary process of producing an article covered by one patent cannot be covered by a later patent to the same inventor, but that the second patent is void on the ground of double patenting.

In Miller v. Eagle Mfg. Co., 151 U. S. 186, the question of double patenting was involved. The Court there held that:

"Two valid patents for the same invention cannot be granted to the same or to a different party * * * although the terms of the claims may differ * * * but that where the second patent covers matter described in the prior patent *essentially distinct and separable* from the invention covered thereby, and the claims made thereunder its validity may be sustained.

"In the last class of cases it must distinctly appear that the invention covered by the later patent was a *separate* invention *distinctly different and independent* from that covered by the first patent; in other words, it must be something *substantially different* from that comprehended in the first patent. It must consist in something more than a mere distinction of the *breadth and scope of the claims* of each patent. If the case comes within the first or second of the above classes, the second patent is absolutely void." (Italics ours.)

The Court further says, in speaking of inventions covered by patents:

"It is not the result, effect, or purpose to be accomplished which constitutes invention, or entitles the party to a patent, but the mechanism, means or instrumentalities by which the object sought is to be attained, but a patentee cannot so split up his invention for the purpose of securing additional results or of extending or prolonging the life of any or all of its elemental parts. Patents cover the means employed to effect results."

The construction put by this Court on the case of Siemens v. Sellers in the Leeds and Catlin decision as to differences in construction, is well stated in the case of Thomson Houston Electric Co. v. McLean, 153 Fed. 883, where the Court says (page 889):

"If differences could be set up to defeat the application of Section 4887 of the Revised Statutes, even when they involve no patentable invention, the statute would have been emasculated, and its application could always have been defeated by trivial and unimportant changes, so that it would be left practically worthless."

This explains very well what is meant by "the principal invention".

The Rules as to Limitation of U. S. by Foreign Patents.

The rules applying to whether a United States patent is limited by a foreign patent may, therefore, be stated as follows:

1. The invention protected by the United States patent must be protected by the foreign patent; in other words, they must both be for the same invention.

2. Where a process and product are for the same invention, a patent for one will limit the other.

3. Where a process and apparatus are for the same invention, a patent for one will limit the patent for the other.

4. It is not necessary that the patents be identical in every respect, but it is sufficient if the principal invention is in both. Mere differences in detail even if the inventions as claimed are, therefore, immaterial.

The Foreign Patents of Claude and Hess.

BRITISH PATENT TO CLAUDE AND HESS, No. 29,750, OF 1896.

The patent was sealed as of June 30, 1896 (Rec., p. 332), and, as it was granted for fourteen years from the date of sealing, it expired June 30, 1910, that is, prior to the filing of the bill of complaint herein.

The *sole question involved is the question of identity of invention.* The provisional and complete specifications are practically the same, except that the provisional specification, in accordance with the British practice, does not have any claims. We will, therefore, only consider the complete specification.

The title is "An Improved Method of Storing Acetylene for Lighting and Other Purposes". The specification states (Rec., p. 335):

> "This invention relates to an improved method of storing acetylene, for lighting and other purposes, in a small volume in order that it may be supplied in portable form to the consumer, and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene and so enable a considerable quantity of acetylene to be stored in a small volume in readiness to be supplied for any purpose for which it may be required."
>
> * * * * * * * * *
>
> "For these reasons we avail ourselves of the great solubility of acetylene in certain liquids, and increase

this solubility by pressure, and this method of storing acetylene gas is the invention which we hereby broadly claim as our invention, whatever may be the liquid employed, the kind of apparatus used, or mode of operation."

The specification gives as the solvents "alcohols" and "*particularly acetones*". The specification continues (Rec., p. 337), as follows:

"With a pressure about equal to that used in a soda-water syphon, we are able to store a considerable volume of acetylene in a receiver of relatively small dimensions."

* * * * * * * * *

"When gas is withdrawn from a receiver containing a solution of acetylene under pressure, the pressure necessarily falls constantly, and to obtain a regular supply of gas we provide the vessel with a *pressure regulator*. The process may be carried out as follows, for instance, although subject to modifications:

" 'The acetylene is dissolved in the liquid chosen, for instance, by the means ordinarily employed in making soda-water, the solution of the gas being facilitated by agitation under pressure in contact with the liquid. The solution under pressure, however obtained, is filled into a receiver of metal or of glass (such as used for soda-water) capable of resisting the pressure employed. The receiver has a *cock* and the necessary adjuncts for connection, directly or through an *expansion chamber*, with the appliances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected.' " (Italics ours.)

There were no drawings filed with the specification, but none were necessary, as a *gas tank having a reducing valve was an old device and well known in the art*, as heretofore pointed out, and as acknowledged by Claude and Hess. In such cases, as was said by this Court in Webster Loom Co. v. Higgins, 105 U. S. 580:

"He may begin at the point where his invention begins, and describe what he has made that is new, and what it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings."

That this is also the law in Great Britain, see Frost on Patents (1891), page 181, and Fletcher-Moulton on Patents (1913), page 89. It is to be noted, moreover, that the United States patent merely shows, but does not describe in detail, the reducing-valve, for the same reason, namely, that this reducing-valve was an old device well known in the art.

Claims 1, 6 and 7 of the British patent read as follows (Rec., pp. 337-8):

> "1. The utilization for the purpose of storage, in a small volume, of large quantities of acetylene gas, of the solubility of said gas in certain liquids by the application of pressure so as to increase the quantity of gas dissolved per unit of volume of liquid as specified.
>
> "6. The employment of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use as specified.
>
> "7. The herein described method of storing acetylene gas in a small volume for lighting or other purposes, which consists in dissolving the acetylene gas under pressure in a suitable liquid solvent such as described from which it can be evolved when required for use."

CLAIM 6 OF THE BRITISH PATENT MUST BE CONSTRUED BY BRITISH LAW.

The first question presented is whether claim 6 is for an apparatus. In such a case, of course, the *British law applies and British authorities will, therefore, control.*

Respondents contend that, since the title is for a method, therefore, the patent can only be construed for a method. This misapprehension is founded on the ancient British construction of patents, before the modern system came into use. The history of the ancient patents is well given by Justice Fletcher-Moulton in the case of British United Shoe Machinery Company v. Fussell & Sons, Ltd., 45 R. P. C. 631. In early times a British patent was granted for little more than the title of the invention, and the nature of the invention had to be established by evidence. This was also true of our own early patent system. Later, it became the practice of requiring a description to be filed after the patent was granted. In such a case, however, it will be obvious that the title would still have a great bearing on what the invention protected was. Still later a description had to be filed before the patent was granted, but this description was still merely explanatory of the title. The Act of 1883 abolished the conditional grant and required a full description, *together with claims,* before

the patent could issue. In accordance with the modern practice, therefore, as in the United States practice, the *claims measure the monopoly,* but are *construed in connection with the specification* (Fletcher-Moulton on Patents, page 119, and British United Shoe Machinery Company v. Fussell & Sons, Ltd., *supra*). Under the present British practice the title does not control what the invention is, and the same is true of the specification (Fletcher-Moulton on Patents, pages 87-8). As was said by Justice Fletcher-Moulton in the above case:

> "A man must distinguish what is old from what is new *by* his claim, but he has not got to distinguish what is old from what is new *in* his claim. If the combination which he has claimed, and for which he asks a monopoly, is novel, that is sufficient. There is no obligation to go further, and to state why it is novel, or what in it is novel." (Italics ours.)

This case is interesting as involving the construction of claims of the same form as claim 6 of the Claude and Hess patent. The claims in suit in that case were as follows:

> "1. The use in a machine for inserting threaded wire into boots, shoes or leather work, of the following instrumentalities, viz: a notating wire-carrying spindle; a connected gripper carrier; a series of wire-feeding grippers carried thereby; a feeding sleeve surrounding the spindle loosely and having gripper closing surfaces; a series of friction blocks bearing against the said spindle frictionally, to operate, substantially, as described" (page 639).
>
> "10. The use of a rotating wire-carrying spindle, the wire-carrying spool mounted thereon and moved thereby; and intermittently actuated wire-feeding devices located near the lower end of the spindle, of a rotating brake and a co-operating guide located between the spool carrying the wire and the said wire-feeding devices to prevent the wire from sliding backwardly within the said spindle, substantially as described" (page 641).

The Court, however, says (page 646) of claim 1 that "it is for a group of *parts*", that is, for a machine or apparatus combination, and of claim 10 (page 647) "the tenth claim is for a part working with this main operating group", that is, it is also for a machine or mechanical *combination.*

Now, the title in that case was for "*Inserting Metallic Fasteners in Boots and Shoes and Leather Work*". This title

would seem to be as much for the process or method as the title of the Claude and Hess patent. The decision, however, illustrates that *the claims and not the title measure the invention.*

That the *title does not control,* even under United States practice, is seen from a number of United States cases. In the case of Commercial Mfg. Co. v. Fairbanks, *supra,* the title of the patent was *"An Improvement in Treating Animal Fats",* whereas the claims were drawn both for the process and for the *product.*

In the case of James v. Campbell, *supra,* the Court held the last claim of the patent for a mechanism or apparatus claim. This claim is as follows:

> "The *employment* and combination of a postmarking device, with a postage-stamp canceling device, both being operated by one and the same handle, for the postmarking of letters, envelopes, or packets, and for the cancellation of the postage stamps thereon with indelible or other ink, in the manner substantially as herein described and set forth." (Italics ours.)

The Court says that this claim

> "may admit of two constructions. It may either amount to a claim for a *combination* of any kind of device for stamping and blotting, or for a *combination* of the particular device *described* in the patent." (Italics ours.)

Now it will be noted that this claim practically has the same form as claim 6 of the Claude and Hess British patent.

CLAIM 6 OF THE BRITISH PATENT IS FOR A GAS PACKAGE.

There is no question but what, under the British law, *claim 6 of the Claude and Hess patent is for the Receiver,* as the word *"employment" has the same meaning as the word "combination" in the present forms of United States claims.* This construction clearly appears to be correct, both from the British authorities cited, and also from the case of James v. Campbell, *supra,* in which the patent claim was construed to be for a combination.

Respondents contend that, even if this claim is construed to be for the apparatus, it is still *lacking in certainty of construction,* and they cite the decision of the Circuit Court of Appeals of the Sixth Circuit in the case of Acme Acetylene Appliance Co. v. Commercial Acetylene Co., *supra,* in which the Court, in considering this point, speaks as follows:

"If this were considered in connection with claim 6 the receiver would still be lacking in *certainty of construction* and its designed function would remain indefinite except as a receptacle from which acetylene under pressure would be '*evolved when required for use*'. It is most difficult to perceive how this would afford the slightest suggestion either of the closed vessel comprised in the patent in suit or the object seemingly accomplished by it. *Evolving gas under pressure from the receiver* according to claim 6 is *not* (as stated in the claims alluded to in the patent in suit) *controlling the outlet as* by a reducing-valve, 'whereby the gas may escape therefrom at substantially uniform pressure'. The difference between the receiver in the one instance and the closed vessel in the other, would seem to be that the former was *intended to contain* and through indifferent means of escape to supply the only thing invented while the latter was intended to be a *distinctive and purposeful* form of invention." (Italics ours.)

Now, as was said by Justice Fletcher-Moulton in British United Shoe Machinery Co. v. Fussell & Sons, Ltd., *supra*:

"A man must distinguish what is old from what is new *by* his claim, but he has not got to distinguish what is old from what is new *in* his claim." (Italics ours.)

CLAIM 6 OF THE BRITISH PATENT, PATENTS THE SAME INVENTION AS THE U. S. PATENT.

In accordance with the *British law*, claim 6 would be held certain, and would be held to cover exactly the same things as claims 1, 2 and 5 of the Claude and Hess United States patent, as the *pressure regulator or its equivalent would be implied* as necessary elements of the claim. If we construe these claims as construed by Judge Quarles in the case of Commercial Acetylene Co. v. Avery Portable Lighting Co., *supra*, that a needle valve is the equivalent for a reducing-valve, then the same combination must necessarily be contained in claim 6 of the British patent. *Evolving gas from a receiver in which the gas is under pressure necessarily implies an outlet, an outlet necessarily implies a valve, and a valve necessarily implies a control of the escaping gas.* If we take a needle-valve as a control, within the meaning of claims 1, 2 and 5 of the United States patent, then any valve will be the equivalent of the reducing-valve set forth in these claims, and, as pointed out above, such a valve is *necessarily*

implied in claim 6 of the British patent. It will be noted, moreover, that this claim 6 sets forth "from which the acetylene is evolved when required for use *as specified*". Now, as pointed out above, while in the British patent as in the United States patent, the claims measure the monopoly, these *claims must be construed in connection with the specification.* The terms "substantially as described" or "as specified" exercise a limiting effect on the claim. Fletcher-Moulton on Patents, page 128. This is also true in the United States practice. See Lake Shore Railway Co. v. Car Brake Shoe Co., 110 U. S. 229, 235, and Jewell Filter Co. v. Jackson, 140 Fed. 340. In referring to the specification of the British patent, the specification reads as follows (Rec., p. 337):

> "When gas is withdrawn from a receiver containing a solution of acetylene under pressure, the pressure necessarily falls constantly, and to obtain a regular supply of gas we provide the vessel with a *pressure regulator* * * * the receiver has a cock and the necessary adjuncts for connection, directly or through an *expansion chamber,* with the appliances in which the gas is used by the consumer." (Italics ours.)

The words "as specified" clearly refer to these parts of the specification.

Respondents take the position that the British patent does not describe the reducing-valve *as a part of the tank.* Now this is immaterial. *A gas tank having a reducing-valve or a pressure regulator as a part thereof and forming a unit therewith was an old device, and was acknowledged to be old by Claude and Hess.* There cannot, therefore, be a patentable distinction between an apparatus in which the pressure regulator or reducing-valve is located in the pipe-line between the tank and the lights, or is connected *directly* to the tank. It would be absurd to say that shortening the pipe between the tank and the reducing valve so that the latter is a mere nipple, as in the Prest-O-Lite tank, would amount to invention. The present case, therefore, clearly comes within the decision of Siemens v. Sellers, *supra,* as construed by the Leeds and Catlin case, and Thomson Houston Electric Co. v. McLean, *supra,* for the reason that the "*principal invention is in both*" *patents,* as they perform "the same function in all particulars". Such a difference does not change the essence or identity of the invention.

While claim 6 of the British patent does not in words include *acetone* as an element, the same is true of claims 1 and 2 of the patent in suit. However, the specification specifies

acetone as one of the solvents to be used, and the difference, if any, between claim 6 of the British patent and claim 5 of the United States patent is, therefore, *merely one of scope,* which is not sufficient to prevent the limitation of the United States patent by the British patent, under the decisions of this Court heretofore referred to. Moreover, as pointed out above, the words "as specified" clearly refer to that part of the specification which describes acetone as a solvent.

There is, therefore, absolutely no question but what claim 6 of the British patent to Claude and Hess is for the same invention as claims 1, 2 and 5 of the United States patent, especially if these claims are given the broad construction given by Judge Quarles. If this construction be given to claim 6, then claims 1, 2 and 5 of the United States patent clearly expired with the British patent on June 30, 1910, that is, over a year prior to the filing of the bill of complaint herein.

EVEN CONSIDERING THE BRITISH PATENT AS A METHOD PATENT, IT IS FOR THE SAME INVENTION AS THE UNITED STATES PATENT.

As pointed out heretofore, *a method and apparatus may be so related that one is dependent upon the other to such an extent that the method approaches and is in effect the function of the machine.* In such a case, of course, the method is unpatentable. Risdon Locomotive Works v. Medart, 158 U. S. 68; Westinghouse v. Boyden, 170 U. S. 537; *In re* Creveling, 1905 C. D. 685. This is for the reason that the *function of a machine is incapable of contemplation apart from the machine itself.* A grant of a patent for such a machine, even if the method be considered patentable, would, therefore, exhaust the patentees' right to the monopoly.

Now, what is the method which corresponds to the application of the patent in suit. To determine this it will be instructive to refer to the abandoned application of Claude and Hess. The claims, as finally submitted to the Commissioner of Patents on appeal, were as follows (Rec., p. 299):

> "1. The herein described method of storing and delivering gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas; and subsequently drawing off the gas from above the solvent through a passage or opening the effective size of which is directly controlled *by and proportionate to the pressure of the gas within the holder.*
>
> "2. The herein described method of storing and distrib-

uting gas, which consists in forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and storing in the solvent large quantities of the gas; and venting the chamber at a point above the solvent and permitting the gas to flow therefrom to the burner or combustion device by reason of its own pressure in quantity *directly proportionate to the rate of consumption or use.*

"3. The method of storing and distributing acetylene, which consists in forcing the same under pressure, into a liquid solvent of acetylene, in a closed vessel; sealing said vessel; transporting the vessel to the place where the gas is to be utilized; connecting it with the pipe supplying the burners; and finally opening communication between the vessel and the main and permitting the gas to flow from the vessel to the burners under its own pressure at a *uniform* rate." (Italics ours.)

THE METHOD AND APPARATUS ARE INSEPARABLY RELATED, AS THE METHOD IS SIMPLY FOR THE FUNCTION OF THE APPARATUS.

As stated above, the Commissioner held these claims unpatentable on the ground that they were *not proper method claims,* the Commissioner holding them to be merely for the *functions of the mechanism* (Rec., p. 300). No appeal was taken, and the application was, therefore, abandoned. *This is an admission by Claude and Hess that the method was,* as the Commissioner stated, *merely the function of the machine,* and that it was, therefore, *incapable of contemplation apart from the machine.* That this is true is clear from a mere comparison of claims 1, 2 and 3 of the abandoned application with claims 1, 2 and 5 of the patent. How can they be considered separately? The claims of the patent describe the contents of the vessel or tank by the method of producing it; thus, claim 1, "a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure"; claim 2, "a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure"; claim 5, "a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent". The method claims, on the other hand, describe the same steps thus: claims 1 and 2, "forcing the gas under pressure into a liquid solvent thereof in a closed chamber, and thereby dissolving and binding in the solvent large quantities of the gas"; claim 3, "forcing the same under pressure, into a liquid solvent of acetylene, in a closed vessel". Similarly, the discharge of the gas through the vent above the

solvent is set forth in both sets of claims. Moreover, even the control of the outlet so as to cause a discharge of the gas under uniform pressure is set forth, both in the process and method claims, in one as a mechanism and in the other as the operation or function of the mechanism.

Now the *claims of the method application correspond in every particular to the method claims* 1 *and* 7 *of the British patent* when those claims are properly construed in accordance with the British practice, and we can, therefore, consider the claims of the abandoned application as being identical to the claims of the British patent.

Now, can these method claims possibly be considered as independent of the apparatus claims in the United States patent? Are they not for the same invention? *Is not one so dependent on the other that they merge into one another?* Would not a patent for one render the other void on the ground of double patenting? Are they not so related as to contemplate the case referred to and contemplated by the Court in Steinmetz v. Allen, *supra*, as to be liable to render one unpatentable on the ground of double patenting?

THE PRINCIPAL INVENTION IS IN BOTH PATENTS.

The *principal invention is certainly contained in both* the United States and British patents, even considering one as an apparatus and the other as a method. The *differences are merely those of expression* due to the fact that such a method was patentable in Great Britain while it was not in the United States. The Leeds & Catlin case does not apply here in the manner contended by the respondents. In the Leeds & Catlin case the element, that is, the phonograph reproducer, *could be used in other combinations*, whether mechanism or method, than the combinations patented by the United States patent in that case, and, therefore, the expiration of the patent for that element would set that element free for use in other combinations than the patented combination. In this case, however, the conditions are entirely different. The *apparatus is not capable of contemplation apart from the method. The apparatus and method are so interwoven one with the other, and "so connected in their design and operation", that they cannot be distinguished, and cannot be contemplated separately, and they merge one into the other. It is not possible to practice the method without infringing the apparatus, when the patent is construed as contended by respondents.*

The tank in the United States case is not the result of the method in the British case, nor is one of the elements, namely, the supersaturated solution of acetylene, the product of the

method of the British application. Neither claim 1 nor claim 7 of the British patent is for the method of producing a supersaturated solution of acetylene, for that was conceded to be unpatentable by Claude and Hess (Record, p. 398). *The method set forth in the British patent, and more particularly claim 7, is for the method of operating the apparatus of the United States patent, and is for the function of this apparatus.*

In this case, the decisions of Mosler Safe & Lock Co. v. Mosler, *supra*, and Miller v. Eagle Mfg. Co., *supra*, clearly apply. *Upon what difference in principle should the necessary process for making an article be held for the same invention as the article, and the necessary method of operating an apparatus, namely, the function of the machine, be not held for the same invention as the machine or apparatus itself?* Do not the same reasons apply to both cases, namely, that a grant of a patent for both would involve an extension of monopoly? The United States and foreign patents, of course, stand in the same relation as two patents to the same party, as the policy of the law is that "the invention shall be free to the American people who never by reason of the expiration of the foreign patent it becomes free to the people abroad".

A United States patent is granted for the instrumentality by which an object is sought to be attained, therefore the function of the machine cannot be patented, for the reason that the first covered all that can be protected, by law, of the second. *Can it then be said that, if Claude and Hess obtained all the law gives them in this country, and if they succeeded in protecting a principle in a foreign patent, namely, the function of the apparatus covered by the United States patent, that the setting free of the monopoly in the foreign country will not set the monopoly free in this country?* If that were true, then a mere difference in scope of the claims of a United States and foreign patent would be sufficient to prevent the foreign patent from limiting the United States patent. This is not, however, the law.

Respondents state that the reason that the method application was abandoned was for the very purpose of preventing the expiration of the foreign patents from affecting the life of the United States patent. But what difference would it have made? If the method and apparatus are truly independent, then one should not affect the other, and the expiration of a foreign patent for a method would only affect the method and not the apparatus patent. Therefore, the reason for *abandoning the method application must either be an admission on respondents' part that the method and apparatus*

are truly dependent, or, that the method was really unpatentable as being for a function of a machine. In both cases the patent would be identical with the British patent, and would expire therewith.

It is submitted, therefore, that even considering the British patent as a method patent, it is still for the same invention as the United States patent and expired with the British patent.

GERMAN PATENT TO CLAUDE AND HESS, No. 97,953.

A certified copy of the patent is inserted at page 202 of the record. The patent was granted on June 28, 1898, but, in accordance with the German law, the patent expired on August 26, 1911, that is, fifteen years less one day from the date of filing. This clearly appears from the certificate signed by the President of the German Patent Office appearing opposite page 202 of the record, and the translation of which is found at page 203.

The title of the invention is stated as "Employment of Liquids Charged with Acetylene for Utilizing Acetylene". The disclosure is more full than that of the British patent. The specification mentions both "*alcohol*" and "*acetone*" as solvents. The specification further states (Rec., p. 204):

> "The vessels for holding the liquid saturated with acetylene must be provided with a *cock or valve* from which the gas escapes according to the diminution of pressure which occurs, and can then be used for the customary purposes." * * *
>
> "Some of the liquids which are employed are combustible. The vapors of the same entrained by the acetylene are, however, in certain instances, more useful than injurious for purposes of illumination, so that they do not require to be removed.
>
> "As the pressure of the gas diminishes whilst escaping from the absorbent liquid, when a constant pressure is required a *pressure-reducer or pressure-regulator* of any desired construction is interpolated."

The specification describes in detail the solution of acetylene in the solvent, and shows, in figure 1, an apparatus by which the solution is accomplished. Figure 2, which is reproduced herewith, shows a gas package or tank very similar to that of the method application, except that no reducing-valve is provided. The specification, however, says (Rec., p. 207):

"In case it is necessary to withdraw the gas at constant pressure from the flask, as already mentioned, a pressure regulator is interpolated, namely, the acetylene may be simply conducted into a gasometer, or *one of the many known pressure reducers is arranged directly over the gas outlet.*" (Italics ours.)

Fig. 2.

The claim is as follows (Rec., p. 207):

"The employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating and the like, characterized by the acetylene being absorbed under pressure by a suitable liquid and the liquid saturated with acetylene being preserved or contained in suitable vessels, from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed."

THE GERMAN PATENT, PATENTS THE GAS TANK.

Now, what form of claim is this, and what does it cover? Can it not be construed as for *an apparatus* if we substitute for "*employment*" *the term* "*combination*" as we have seen is a proper construction to be given to the claims in accordance with the British practice, and also to United States claims as in the case of James v. Campbell, *supra?* It can, moreover, be construed as a claim covering *both a process and an apparatus.* Even in accordance with the United States practice, it is possible to cover both a process and an apparatus in a single claim, as clearly appears from the claim of the patent in suit in the Telephone Cases, 126 U. S. 1, in which the claim was as follows:

"The method of, and apparatus for, transmitting vocal or other sounds telegraphically, as herein described, by causing electrical undulations similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

This claim was held to cover both the process and the apparatus, and was approved as late as 1904 in the case of Steinmetz v. Allen, *supra*, where the Court says:

"The claim was held to the art described and the means of making it useful."

Construing the claim as an apparatus claim, and substituting "combination" for "employment", we have, of course, a claim which is *identical, element for element, with the claims of the patent in suit.*

Respondents lay great stress upon the last few lines of the German specification, which read as follows (Rec., p. 207):

"Indeed, the apparatus described above, and shown in figures 1 and 2, are only given by way of example for explaining the process, *and the latter* is independent of the described constructional forms." (Italics ours.)

It will be noted, however, that the last paragraph of the patent in suit reads as follows (Rec., p. 426):

"It is not intended to limit the invention to the specific construction herein shown, since modifications may obviously be made."

What is meant by these two statements, which are found in patent specifications of the different countries in the world, is that the patentee does not intend to limit himself to the *details of construction*, but that the patent contemplates equivalents. It is to be noted that, while the German patent describes in detail the process of supersaturating the solution with acetylene, this is done because the *tank itself was an old article*, as appears throughout the specification. It is interesting to note, however, that the *title is not* for a "*process*", but for the "*employment* of liquids charged with acetylene for utilizing acetylene". If the patent was only intended to cover the process, then surely the title as well as the claim would have used the word "process" instead of the word "employment". As heretofore shown, however, the title above does not control the scope of a patent.

THE GERMAN PATENT AS A METHOD PATENT IS MERELY FOR THE FUNCTION OF THE APPARATUS.

Even considering the claim as for a method, it is quite obvious that it is merely for the *function of the apparatus* of the United States patent, and is, therefore, *for the same invention* as the United States patent, for the reasons pointed out above in connection with the discussion of the British patent as a method patent. It is interesting to note that the claim of the German patent when *construed as a method claim is practically identical with the claims as presented to the Commissioner in the abandoned method application of Claude and Hess, which claims were held to be merely for the function of the apparatus.*

Construing the claim as a *process which produces the article* of the United States patent, it still is for the same invention under the decision of Mosler Safe & Lock Co. v. Mosler, *supra.*

It will, therefore, be seen that *no matter what construction is given the claim, whether as a method or an apparatus, it is still for the same invention as the United States patent,* and being for the same invention limits its term. The German patent expired, as noted above, on August 26, 1911, nine days after the filing of the bill of complaint herein, and before the grant of the order for the preliminary injunction.

FRENCH PATENT TO CLAUDE AND HESS, No. 257,679, AND ADDITIONS.

The original patent was filed on June 30, 1896, for a term of fifteen years from the date of filing, so that it expired on June 30, 1911. The original patent was granted on October 19, 1896. Claude and Hess thereafter filed four patents of addition, granted, respectively, March 20, 1897, October 15, 1897, June 11, 1897, and April 26, 1898, that is, all prior to the issuance of the patent in suit. These patents of addition, in accordance with the French law, expired with the original.

The patent, with its addition, together with their translations, constitute pages 338-359 of the record.

The title of the original patent is for "A System of Storing Acetylene". The specification practically follows the British patent, except that it does not specify acetone, but does specify *alcohol* as a solvent. In describing the operation of the tank, the specification states (Record, p. 342):

> "When from a recipient containing an acetylene solution under pressure the gas is abstracted, the pressure will necessarily *decrease* constantly. When we wish to secure a *regular* supply of gas, such as is necessary, *e. g.*,

for lighting purposes, we fit the recipient with an *expander* of suitable construction." (Italics ours.)

The specification concludes with "Resume" as usual in French patents, as follows (Record, p. 343):

"1. For the storage of large quantities of acetylene in a small space, the application of the solubility of this gas in certain liquids, using pressure for the purpose of increasing the amount of gas dissolved per unit of volume of the liquid, as described above.

"2. For the purpose of effecting the solution under pressure of large quantities of acetylene in a small volume of liquid, the use of methods and *apparatus* employed to cause the solution under pressure of other gases in other liquids, especially of carbonic acid in water." (Italics ours.)

The Certificates of Addition describe the use of a filler in the tank as illustrated in the present Prest-O-Lite tank, "Defendants' Exhibit No. 1". The second certificate of addition (Record, p. 349) and the third (Record, p. 353), however, describe the use of *acetone* as a solvent. The third and fourth Certificates of Addition illustrate gas tanks having *needle valves*, the drawings being inserted at page 206 of the record.

A FRENCH PATENT, PATENTS ALL IT DISCLOSES.

The original patent, of course, contains a complete disclosure of the gas tank of the patent in suit. The invention is described as a *"system", not as a process or method,* and the "Resume" especially refers to both "method and *apparatus"*. It is to be noted, however, that, in accordance with the French law, a *French patent protects everything that is novel in the patent,* and the "Resume" at the end of the patent, therefore, does not confine the monopoly. However, the *Certificates of Addition,* especially the last two, *unquestionably are for the apparatus,* namely, the *gas tank.* While these Certificates of Addition were filed after the filing of the United States patent, they issued before the United States patent, and, therefore, limit the term of the United States patent (Bate Refrigerating Co. v. Sulzenberger, *supra*).

It is immaterial, however, whether the French patent with its Addition be construed as a method or as an apparatus patent, for, if construed as a method patent, it is *merely for the method of operating the apparatus,* constituting the function of the apparatus, and, therefore, under the decisions *of this Court, is for the* same invention.

In conclusion, it may be stated that the French, British, German and United States patents were prepared by different solicitors, and in accordance with the variations in practice of the different countries, it is, therefore, to be expected that there will be variations in the language and in the terms of the claims. As was said by the Court in Electric Accumulator Co. v. Julien Electric Co., 47 Fed. 892:

> "In approaching the subject of identity it should be remembered that Faure is a Frenchman and that the first description of his invention was written in the French language. From this original it was translated into Spanish and English. Making allowance for philological differences, for errors and unavoidable changes in translation, and for dissimilarities in Patent Office procedure, *it would hardly be expected that the United States and Spanish patents would emerge from such an ordeal in identical garb*, even though it were the avowed purpose of the inventor to make them the same." (Italics ours.)

THE DECISION OF THE COURTS IN COMMERCIAL ACETYLENE COMPANY v. ACME ACETYLENE APPLIANCE COMPANY (188 Fed. 89, and 192 Fed. 321).

The Circuit Court placed a wrong construction on the Leeds & Catlin case. The Circuit Court construed the Leeds & Catlin decision to mean that a *method and apparatus* are *always independent*, and can *never be dependent*. This is, however, entirely contrary to the case of Steinmetz v. Allen, *supra*, and, as pointed out heretofore, such a construction cannot be placed upon the Leeds & Catlin case. *The Circuit Court makes no distinction whatsoever between independent and unrelated inventions on the one hand and dependent and related inventions on the other hand.* It does not even seem to have considered that a mere function of an apparatus or machine is for the same invention as the apparatus or machine itself, as the latter is the patentable embodiment. The *Court does not construe the sixth claim* of the British patent, *in accordance with the British practice*, as indicated by the decisions of the British courts and not even in accordance with the liberal decisions of this Court, but places the *strictest construction* on this claim. The Court lays too much emphasis on the title and description of the British patent, which, while, as shown above under the old law did have considerable bearing on the construction of the claims, under the present British practice,

which is controlling in this case, does not have the vital effect. The Court seems to go on the assumption that a method and apparatus can never be contained in the same British patent.

The Court of Appeals of the Sixth Circuit falls into the same error as the Circuit Court. This Court, however, makes the additional error that the *British claim must correspond element for element with the United States claim,* when the decisions of this Court are exactly the opposite. In short, the Circuit Court and the Circuit Court of Appeals do not seem to have looked at this case in accordance with the *British law,* which should control, or even in accordance with the liberal United States practice, and, in addition, the Court wholly misconstrues the Leeds and Catlin case.

COMMERCIAL ACETYLENE COMPANY v. SEARCHLIGHT GAS CO. (188 Fed. 85, 197 Fed. 908, 203 Fed. 276).

The question of the expiration of the patent first came before the Circuit Court on a motion for preliminary injunction. The Court, in considering this point, speaks as follows (188 Fed.):

> "In determining the meaning of the word 'patented' in section 4887, the courts have not confined themselves to its narrow sense as applying to what is specifically covered by the claims. Such a construction would manifestly lead to absurdity; for if nothing less than a literal copy of the foreign patent could be held the same invention, it would not be difficult for the skillful patent solicitor to defeat the intent of the statute by mere colorable changes in the specification and claims. *It is very clear that the Court must look through mere form and phraseology and determine what was the essence of the invention laid open to the public by the foreign patent, and base its decision upon matters of substance rather than those of form.*" * * *
>
> "It is difficult to understand how, given the liquid acetylene as an article free to all, its monopoly can be further prolonged by claiming it in combination with an ordinary tank or other receptacle for transportation as a combination patent. Had the two patents been granted in this country, there would seem to be little doubt but that the patent in suit, under the present record, must be held void, under the rule laid down in cases of double patenting." (Italics ours.)

The matter then came up on final hearing, and the Court again held that the United States patent expired with the foreign patents. We can do no better than quote from the decision of the Court. Says the Court, 197 Fed.:

> "It is defendants' contention that if, as found in the Avery case, the use of an ordinary needle-valve is an infringement or equivalent of complainant's reducing-valve, *then the apparatus in suit is disclosed in the foreign expired patents, and that, if a needle-valve is the equivalent of a reducing-valve, a stop cock would be the equivalent of a needle-valve, and, therefore, of a reducing-valve.* True, a needle-valve would resist the pressure of the contained gas somewhat more accurately than an ordinary valve or cock; *but the difference would be one of degree.* Given the right to use a supersaturated solution of acetylene produced by forcing acetylene into acetone under pressure, infringement can hardly be predicated upon the use of an ordinary receptacle with an ordinary outlet valve, in distributing the same." (Italics ours.)

And,

> "It is claimed that all four of the foreign patents are for substantially the same invention; each having claims for the storing of acetylene, as well as for the receptacle required therefor, and for distributing or delivering the gas to the destination, whether tank or customer. Each of these patents provides, by claim and specification, for a cock or valve to control the distribution of the gas as hereinafter set out. It will be noticed that claim 6 of the British patent calls for 'a receiver containing a liquid charged with acetylene under pressure', etc., as an element of the combination. This is also true of claim 1 in suit. Claim 2 in suit calls for a package, a solvent for acetylene in the package, contained acetone, gas contained in the solvent, etc. These elements, whether separately enumerated or combined into a charged package, are substantially identical. The reducing-valve and the discharge-valve are plainly found in all the foreign patents and that in suit, as well as in the abandoned so-called method patent."

And,

> "The foreign patents, including the British patent, even provide for the delivery of the package, already charged, as an article of merchandise, and the substitu-

tion for an exhausted package of a renewed package, to consumers, as does that in suit. It is difficult to conceive of the employment of any package or container used in storing and distributing acetylene gas under pressure, however crude and common, which would not infringe the device in suit, were the complainants' contention to be sustained"

This decision was affirmed by the Circuit Court of Appeals of the Seventh Circuit (203 Fed. 276), where the Court, in holding that the United States patent expired with the British patent, speaks as follows:

"The British patent and the patent in suit are for substantially the same invention. The claims and the specifications show this. Both are for storing acetylene. Both describe a receptacle therefor; both are for the distribution of the acetylene and control of such distribution. *All distinctions sought to be made are distinctions in terms, in modes of expression, mere descriptive words. The patented invention is the same in both.* The British patent having expired, the patent in suit expired with it." (Italics ours.)

QUESTION OF LIMITATION OF U. S. BY FOREIGN PATENTS IS STILL IMPORTANT.

The question of expiration of United States with foreign patents is still an important question, even though section 4887 was revised by the act effective January 1, 1898. There are still many United States patents granted long after 1900, the applications of which were filed prior to January 1, 1898. To show the possibilities attention is directed to the Annual Report of the Commissioner of Patents for the year ending December 31, 1914, Vol. 211 O. G. 646, in which it will be noted that the number of patents pending fifteen years or longer on January 1, 1912, was fifty-nine.

ANTICIPATION OF THE PATENT IN SUIT.

The Prior Art.

GERMAN PATENT TO WEBB, NO. 58,927, PUBLISHED SEPTEMBER 21, 1891.

This patent has been generally referred to in the discussion of reducing-valves, and the translation thereof is found at page 316 of the record. The title of the invention is *"Interchangeable Tank for Gas Lighting Apparatus of Vehicles"*.

In this patent there is a tank A using an illuminating gas under *high pressure* from which the gas is supplied to the light L through a *reducing-valve* V. It is to be noted that this patent describes the complete system of refilling, as the tank is so constructed that it can be readily connected to and from the pipe.

JOURNAL OF FRANKLIN INSTITUTE, PUBLISHED IN 1895.

This article has been briefly referred to heretofore, and it shows opposite page 237 of the record a lighting system in which a tank containing *liquified acetylene* supplies gas to the lights through a *reducing-valve* upon which the tank stands. Here we have a case of a liquified gas furnished (*as a solution*) in tanks under high pressure, so that the gas may be condensed in a small space, together with a *reducing-valve* to deliver the gas at low uniform pressure.

BRITISH PATENT TO GEARING, NO. 22,183 OF 1894, PUBLISHED OCTOBER, 1895.

In this patent, the drawing of which is found opposite page 322 of the record, a tank a is adapted to receive water and calcium carbide, so that acetylene will be generated therein under a *pressure* of 800 pounds per square inch. The tank is provided with a *reducing-valve* i which delivers the acetylene to the lighting pipe 1 under a *uniform* and *low pressure.* It is to be noted that, in view of the fact that acetylene is soluble in water, *part of the gas will be dissolved in the water, and will escape therefrom when the pressure is reduced.* Here we have, therefore, a complete tank containing, when in use, *a supersaturated solution of acetylene, and a reducing-valve.*

GERMAN PATENT TO LOESNER, NO, 82,437, PUBLISHED JULY 5, 1895.

The translation is found on page 383 of the record. This patent is for a "Process for Separating Chlorine from Gaseous Mixtures". In accordance with this process, chlorine is dissolved in a solvent under pressure, it being stated that the amount that the solvent will hold will increase with an increase in pressure. In order to utilize the chlorine the pressure in the apparatus is reduced, resulting in an evolution of the chlorine from the solvent. We have here, therefore, a *complete process and apparatus in which a gas is dissolved in a solvent under pressure to produce a supersaturated solution, and the utilization of this gas by reducing the pressure.*

HENRY'S LAW AS APPLIED TO ACETYLENE.

As stated heretofore, it was a well-known scientific fact that *gases were soluble in liquids, and that the quantity of gas dis-*

solved by a given liquid increased with an increase of pressure. It was also a known fact that acetylene was soluble in a great number of liquids, among them being alcohol, see page 2 of this brief. It was, of course, obvious that *acetylene, in common with other gases, would follow Henry's law,* and that the amount of acetylene which could be held in solution by a certain solvent would increase with the pressure.

Claude and Hess did not, therefore, discover that acetylene was soluble in alcohol, as that was a known fact. Moreover, it appears from the certificate of addition to Claude and Hess' French patent No. 257,679, that *Claude and Hess did not discover the peculiar affinity of acetone for acetylene, but that this was discovered by Berthelot and Vielle.* Thus, in this certificate of addition taken on June 11, 1897, appears the following very significant statement:

> "It is known, from researches made by Messrs. Berthelot and Vielle, that the dissolution of acetylene in acetone under a pressure which is not very much over ten atmospheres cannot explode, that only is explosive the space above the liquid which is filled with acetylene gas" (Rec., p. 353).

It is significant in this connection that *Berthelot* is also the one that *discovered the solubility of acetylene in alcohol and other liquids.* Thus, in 1866, Berthelot published his results on the researches as to the solubility of acetylene, an extract being given on pages 222-223 of this record. The text-books give Berthelot credit for this (see an extract from Wurtz's Dictionary of Chemistry inserted at page 304 of the record).

WHAT DID CLAUDE AND HESS INVENT OR DISCOVER?

What, then, did Claude and Hess invent or discover? *Not a new method of storing gases,* for they admit by the abandonment of their method application that the method is not patentable. *Not a new property of a gas,* for they admit that they did not discover that (Rec., p. 265). They did *not* discover the fact *that acetylene was soluble in liquids, and that this solubility increased with an increase of pressure,* for that was a well-known scientific fact, and it was, moreover, known that acetylene was soluble in one of the specific solvents mentioned in the specification, namely, alcohol. They did *not* invent a *new apparatus for storing gases,* for an apparatus comprising a gas tank with a reducing-valve was admittedly old, and is, moreover, shown by the prior art. They did *not* invent a *new apparatus in which a gas is stored in a solvent under high*

pressure, for that was a well-known apparatus for storing carbonic acid gas for use in making carbonated beverages, the common selzer bottle being an illustration. Moreover, an apparatus for storing a gas in a solvent under pressure, and for subsequently evolving this gas by the reduction of the pressure was old, as described in the Loesner German patent.

Judge Quarles thought that Claude and Hess were the first to discover the use of acetone as a solvent for acetylene, and he laid great stress upon the fact that acetone would dissolve twenty-five times its volume of acetylene. That Claude and Hess discovered this fact is *very doubtful,* in view of the admission by Claude and Hess in their French patent of addition, by which they credit this discovery to Berthelot and Vielle, as pointed out heretofore. *It is, moreover, a significant fact that Claude and Hess never claimed this discovery in any of their patents, nor did they ever claim to be the discoverers of a composition comprising a supersaturated solution of acetylene in acetone.*

PATENT IS NOT FOR A PATENTABLE COMBINATION.

Admitting, however, that Claude and Hess were the first to discover that acetylene is soluble in acetone in large proportions, in other words, were the first to discover a supersaturated acetylene-acetone solution, *does that make the combination of a tank, a reducing-valve and a charge of a specific acetylene solvent, together with a charge of acetylene, patentable as an apparatus?*

As was said by this Court in Thompson v. Boisselier, 114 U. S. 1, 11:

> "It is not enough that a thing shall be new, in the sense that in the shape or form in which it is produced it shall not have been before known, and that it shall be useful, but *it must, under the Constitution and the statute, amount to an invention or discovery.*" (Italics ours.)

This statement has been cited with approval in the case of Hill v. Wooster, 132 U. S. 673, and many other decisions.

In the case of Underwood v. Gerber, 149 U. S. 224, the patent was for a carbon sheet comprising a sheet of material coated with a *certain composition.* The Court, however, held that the addition of a specific coloring composition to a sheet did not make the same patentable as a *sheet;* that is, an article of manufacture, but that the *patentability,* if any, *resided in the composition.* This case was cited with approval in Brigham v. Coffin, 149 U. S. 557, in which the patent in suit was

for a *fabric* having its surface printed with ornamental figures in an ink of a *certain composition.* The Court held that, although "Alrich may be entitled to a patent for the composition", this fact did not import patentability to the fabric *as an article of manufacture.*

In the case of Morgan Envelope Co. v. Albany Paper Co., 152 U. S. 425, the patent in suit was for a toilet paper holder in which the paper was claimed as an element of the combination. The Court, in considering this point, speaks as follows:

> "The first defense raises the question whether, when a machine is designed to manufacture, distribute or serve out to users a certain article, the article so dealt with can be said to be a part of the combination of which the machine itself is another part. If this be so, then it would seem to follow that the log which is sawed in the mill; the wheat which is ground by the rollers; the pin which is produced by the patented machine; the paper which is folded and delivered by the printing press, may be claimed as an element of a combination of which the mechanism doing the work is another element. The motion of the hand necessary to turn the roll and withdraw the paper is analogous to the motive power which operates the machinery in the other instances."

While the Court does not directly pass upon this point, it considers the matter from the standpoint of infringement. Says the Court:

> "The real question in this case is, whether, *conceding the combination of the oval roll with the fixture to be a valid combination,* the sale of one element of such combination, with the intent that it shall be used with the other element, is an infringement. We are of opinion that it is not. There are doubtless many cases to the effect that the manufacture and sale of a single element of a combination, with intent that it shall be united to the other elements, and so complete the combination, is an infringement (Saxe v. Hammond, Holmes 456; Wallace v. Holmes, 9 Blatchf. 65; Barnes v. Straus, 9 Blatchf. 553; Schneider v. Pountney, 21 Fed. Rep. 399). But we think these cases have no application to one where the element made by the alleged infringer is an article of manufacture perishable in its nature, which it is the object of the mechanism to deliver, and which must be renewed periodically, whenever the device is put to use.

Of course, if the product itself is the subject of a valid patent, it would be an infringement of that patent to purchase such product of another than the patentee; but if the product be unpatentable, it is giving to the patentee of the machine the benefit of a patent upon the product, by requiring such product to be bought of him. To repeat an illustration already put: If a log were an element of a patentable mechanism for sawing such log, it would, upon the construction claimed by the plaintiff, require the purchaser of the sawing device to buy his logs of the patentee of the mechanism, or subject himself to a charge of infringement. *This exhibits not only the impossibility of this construction of the patent, but the difficulty of treating the paper as an element of the combination at all.* In this view, the distinction between repair and reconstruction becomes of no value, since the renewal of the paper is in a proper sense neither the one nor the other." (Italics ours.)

The *principles involved* in the above cases apply to this case. Here not only is the tank with its reducing-valve and other peculiar constructions claimed in combination with the charge of the solvent (which Judge Quarles considered as acetone), but also in combination with *acetylene contained in the solvent.* Judge Quarles, in the case of Commercial Acetylene Co. v. Autolux Co., 181 Fed. 387, even went so far as to hold that filling the tank with acetylene was an infringement of the patent, in spite of the fact that the decision of this Court in the Morgan Envelope Company case is directly opposite.

How can acetylene and acetone of a supersaturated solution be an element of a valid apparatus combination, granting that the supersaturated solution is new as an element? *How does it qualify* the operation of the tank and a valve in any other manner than when the tank is filled with a compressed gas, or with a liquefied gas? There is no question, and it is not denied, that the tank and valve operate in the same manner in each case. A supersaturated solution of acetone and acetylene may be new as a composition, but the *composition is,* in that case, *the invention. The inventor of the new composition cannot obtain a patent for an apparatus of which this composition merely forms an element.* If it were otherwise, then every new solvent would entitle the inventor of the solvent to a new patent for an apparatus. That this is not the law is clear from the Morgan Envelope Company case; Underwood v. Gerber, and Brigham v. Coffin. To the same effect is Langan

v. Warren Axle & Tool Co., 182 Fed. 720. This is also the present law as applied by the Patent Office in accordance with the decisions of the Court of Appeals in the cases of *In re* Hawley, 1906 C. D. 576, and *In re* Ratican, 36 App. D. C. 95.

PATENT IS FOR AN AGGREGATION.

In Pickering v. McCullough, 104 U. S. 310, this Court lays down the law as to patentable combinations as follows:

> "In a patentable combination of old elements, all the constituents must so enter into it as that each qualifies every other; to draw an illustration from another branch of the law, they must be joint tenants of the domain of the invention seized each of every part, *per my et per tout*, and not mere tenants in common, with separate interests and estates. It must form either a new machine of a distinct character and function, or produce a result due to the joint and co-operating action of all the elements, and which is not the mere adding together of separate contributions. Otherwise, it is only a mechanical juxtaposition, and not a vital union."

Now, while it is conceded that the rule as given in that case is the strict rule, nevertheless, it illustrates the true principles applying to combinations. Good examples of the rule as actually applied by this Court are found in the cases of Richards v. Chase Elevator Co., 158 U. S. 299, and in the earlier cases of Hailes v. Van Wormer, 20 Wallace 353; Smith v. Nichols, 21 Wallace 115, and Stearns v. Russell, 85 Fed. 218.

In this case *each element of the combination acts in the same way as it did before.* The tank performs the same function as a strong portable container; the reducing-valve the same function as a device for reducing the high pressure to a uniform and constant low pressure; the solvent acts in the same way that it does generally, that is, it holds large quantities of gas, as in the soda water fountains, and as in the Loesner German patent. It is true a tank containing a solvent of the gas will hold more gas, volume for volume, than a tank in which the gas is simply compressed, but *that is due to the characteristics of a solvent*, namely, the one element, and *not to the whole combination*. All of the advantages in the alleged combination are due to the presence of the solvent, and to that alone. *The combination itself is, however, unaltered. It is the same whether the gas is compressed in a solvent or in the absence of a solvent.* Each element operates in the same manner as it did before, and the provision of the

solvent merely altered the combination as a whole *in a matter of degree,* and the entire combination involved nothing but the *carrying forward of an old idea.* As was said in the case of Smith v. Nichols, *supra*:

> "But a mere carrying forward or new or more extended application of the original thought, a change only in form, proportions or *degree,* the substitution of equivalents, doing substantially the same thing in the same way by substantially the same means with better results, is not such invention as will sustain a patent." (Italics ours.)

To show that the invention involves a mere matter of degree *as far as the entire combination is concerned,* take the Gearing patent, in which the tank contains water or lime water, each of which is capable of dissolving one volume of acetylene for each atmosphere of pressure (Record, p. 220). If we substitute for water, choloroform or benzine, then the amount dissolved will be four volumes per atmosphere of pressure, and for alcohol six volumes per atmosphere (Record, p. 223). Now acetone will dissolve still more, that is, twenty-five volumes. *Is it to be understood that, if some other person should discover a new solvent which would dissolve fifty volumes, he could then also obtain a patent for combination comprising a gas tank containing a reducing-valve and this new solvent with acetylene dissolved therein?* If that were true, then patents would be granted not for the invention, namely, the solvent, but for an apparatus of which the solvent, namely, the composition, would form only a novel element. This is not, however, the law.

The lack of co-operation in alleged combinations like the one of the patent in suit, is well brought out in the case of Stearns v. Russell, *supra,* in which the patent related to a Pill Dipping Machine, in which the pills were dipped by a certain mechanism in a gelatine bath. Taft, Judge, discusses the question involved as follows:

> "The gelatine and its receptacle are not co-acting parts of a mechanism of which the bar is also a part. There is no relation between them at all, except as it is initiated and maintained by the voluntary manual and continuously guiding act of the human operator. It is no more proper to describe the dipping-bar as a co-element in dipping mechanisms with the pill and the gelatine bath than it is to describe the ax as a co-element of the log and the chopping-block in mechanism for splitting wood."

We should keep in mind that the specification describes *both alcohol and acetone.* Claims 1 and 2 cover broadly any solvent as an element. Claim 5, it is true, specifies acetone, but, under the doctrine of equivalents, it must be understood that it covers either acetone or alcohol. Now it is axiomatic that *that which will infringe if later will anticipate if earlier.* We have, therefore, the following conditions as known things in the prior art.

KNOWN THINGS IN PRIOR ART.

The tank and its reducing valve used for the same purpose.

An acetylene solvent, namely, alcohol.

That the amount of acetylene soluble in the solvent will increase with an increase of pressure, and that a decrease of pressure will set the acetylene free.

An apparatus in which the gas is dissolved in a solvent under pressure, and from which the gas is evolved upon a decrease in pressure.

APPARATUS IS A MERE DOUBLE USE OF PRIOR ART.

Is there any invention in the utilization of an old apparatus for performing an old process with an old solvent of an old gas?

It is well settled that the *mere double use of an old means for a new but analogous purpose is not patentable.* 30 Cyc 852; Robinson on Patents, Section 259; Walker on Patents, Section 38; Brown v. Piper, 91 U. S. 37; Roberts v. Ryer, 91 U. S. 150; Pennsylvania Railroad Co. v. Locomotive Engine Safety Truck Co., 110 U. S. 494; Potts v. Creager, 155 U. S. 597; Mast, Foos Co. v. Stover Mfg. Co., 177 U. S. 485; Stearns v. Russell, 85 Fed. 218.

As was said by Mr. Chief Justice Waite in Roberts v. Ryer, *supra*:

> "It is no new invention to use an old machine for a new purpose. The inventor of a machine is entitled to the benefit of all the uses to which it can be put, no matter whether he had conceived the idea of the use or not."

In Potts v. Creager, Mr. Justice Brown lays down the rule as follows:

> "As a result of the authorities on this subject, it may be said that, *if the new use be so nearly analogous to the former one, that the applicability of the device to its new use would occur to a person of ordinary mechanical skill,*

it is only a case of double use, but if the relations between them be remote, and especially if the use of the old device produce a new result, it may at least involve an exercise of the inventive faculty. Much, however, must still depend upon the nature of the changes required to adapt the device to its new use." (Italics ours.)

The same Justice delivered the opinion in Mast, Foos Co. v. Stover Mfg. Co., and in discussing the particular case, speaks as follows:

"Martin, therefore, *discovered no new function; and he created no new situation*, except in the limited sense that he first applied an internal gearing to the old Mast-Foos mill, which was practically identical with the Martin patent, except in the use of an internal gearing. He invented no new device; he used it for no new purpose; he applied it to no new machine. *All he did was to apply it to a new purpose in a machine where it had not before been used for that purpose.* The result may have added to the efficiency and popularity of the earlier device, although to what extent is open to very considerable doubt. In our opinion this transfer does not rise to the dignity of invention. We repeat what we said in Potts v. Creager (155 U. S. 597, 608):

'if the new use be so nearly analogous to the former one that the applicability of the device to its new use would occur to a person of ordinary mechanical skill, it is only a case of double use.'

" * * * *While it is entirely true that the fact that this change had not occurred to any mechanic* familiar with windmills is evidence of something more than mechanical skill in the person who did discover it, it is probable that no one of these was fully aware of the state of the art and the prior devices; but, as before stated, in determining the question of invention, we must presume the patentee was fully informed of everything which preceded him, whether such were the actual fact or not." (Italics ours.)

In Stearns v. Russell, *supra*, Taft, J., discusses the same rule as follows:

"It would seem to follow as a corollary to these two propositions that *where it requires substantially no change in the old device to adapt it to the new use such adaptation cannot be the subject of a patent*, no matter

how remote and unthought of the new use may be, provided *no new force or mode of application* be necessary in carrying on such use. Otherwise in case the device has been patented the right of monopoly of the prior patentee is invaded by excluding him from a use of a machine which by the rule stated and the authorities cited above he is entitled exclusively to enjoy. * * * The general rule, however, is stated by Mr. Justice Gray, in delivering the judgment of the Supreme Court in Pennsylvania R. Co. v. Locomotive Engine Safety Truck Co. (110 U. S. 490, 494, 4 Sup. Ct. 220), as follows:

"'It is settled by many decisions of this Court, which it is unnecessary to quote from or refer to in detail, that the application of an old process or machine to a similar or analogous subject, *with no change in the manner of application, and no result substantially distinct in its nature*, will not sustain a patent, even if the new form or result has not before been contemplated.'" (Italics ours.)

German patent to Loesner, as pointed out above, disclosed the result, namely, the *general idea of storing a gas in a solvent under pressure, and evolving the gas from the solvent by reduction of the pressure.* The result was, therefore, old. It is true the patent does not show by drawings any specific apparatus for carrying out this process, for the reason that the *apparatus was old and well known in the art.* Any artisan in that art would know what apparatus to use, as it would merely require any suitable tank having a valve, such as is used in the manufacture of carbonated waters. Furthermore, in the ordinary soda fountain and seltzer bottle, *carbonic acid gas is stored in water under pressure.* It is true, in neither one of the above citations is acetylene gas stored, nor is gas stored for the purpose of illumination, but it was *old to store gas in a tank equipped with a reducing-valve,* either under high pressure, or as a liquid, as is seen from German patent to Webb, British patent to Gearing, and Journal of Franklin Institute, heretofore referred to. The question is, therefore, *would it involve invention to apply the Loesner idea to acetylene, when it was well known that acetylene was soluble in many liquids, including alcohol, one of the solvents mentioned in the patent in suit.* From all of the decisions of this Court, it is entirely clear that this would not involve invention. "The new use (is) so nearly analogous to the former one, that the applicability of the device to its new use would occur to a person of ordinary mechanical skill", and it would not

require any change whatsoever "to adapt the device to its new use" (Potts v. Creager). The result was also old. Claude and Hess "discovered no new function; and (they) created no new situation, except in the limited sense that (they) first applied (the Loesner idea) to the old (Webb compressed acetylene tank, and the liquid acetylene tank) which was practically identical with the (Claude and Hess) patent, except in the use of (a gas solvent). (They) invented no new device; (they) used it for no new purpose; (they) applied it to no new machine. All (they) did was to apply it to a new purpose in a machine where it had not before been used for that purpose" (Mast, Foos Co. v. Stover Mfg. Co.). "It required substantially no change in the old device to adapt it to the new use. * * * There is no change in the manner of operating the machine, and the result is not substantially distinct in its nature" because it is in each case the storing of a gas in a solvent under pressure and the subsequent use by reducing the pressure. It is true they could store more, but that "is only a matter of degree" (Stearns v. Russell).

Here *the general conception, that is, storing a gas in a liquid under pressure and evolving the gas by a release of the pressure, is the same whether chlorin or acetylene, and whether carbonic acid gas or acetylene is the gas. The only difference is in the gas and the use. But the mere difference in the use of the apparatus for acetylene and for lighting does not make the apparatus patentable as an apparatus*, because the apparatus itself might be used for other purposes than for lighting, and the solvent itself might be used for other gases than acetylene. Is it then to be understood that the use of the Prest-O-Lite tank for storing another gas than acetylene will not be an infringement of the patent? Such a question might be material in a process, but not in an apparatus. Here the plaintiff cannot contend that the claims must be construed for a process or method, because, as in the case of Stearns v. Russell, Claude and Hess abandoned the process, and they are, therefore, as in the Stearns v. Russell case, "estopped from contending for any construction of (their) present patent which would in effect secure (them) the same thing".

THE ACETYLENE GAS TANK WAS NOT DEVELOPED EARLIER BECAUSE IT AWAITED THE ADVENT OF CALCIUM CARBIDE.

The question naturally arises why the alleged invention was not developed before the date of the Claude and Hess patent. The answer is that, as explained heretofore, it was not until just a few years before the date of this patent that a com-

mercial method of producing calcium carbide and acetylene was discovered by Wilson. In fact, the "Scientific American", an extract of which is produced on page 433 of the record, states that:

> "The introduction of acetylene for lighting and other industrial purposes is of rather recent date. Prior to 1895 this gas was scarcely known outside chemical laboratories, but the discovery of calcium carbide and the process of making it, made this gas available for commercial use."

Now, for ordinary house lighting, an ordinary generator, such as shown opposite page 236 of this record, was sufficient, and it is significant to note that complainants have not proved any extensive use of the gas package for house lighting. The extensive use has been practically altogether in furnishing gas tanks for automobiles. As is well known, however, it was not really until after 1900 that the automobile began to come into general use.

The above shows why we have no prior mention of an acetylene gas package containing a solvent of acetylene in which the gas is stored under pressure. The reason is that, first, acetylene was not a commercial article until about the time of the patent, and, second, the tank had no use before the advent of the automobile.

THE LARGE SALES AND USE OF COMPLAINANTS' GAS TANK DOES NOT IMPORT PATENTABILITY.

We can do no better than to quote from the decision of this Court in the case of McClain v. Ortmayer, 141 U. S. 419, 428:

> "That the extent to which a patent device has gone into use is an unsafe criterion even of its actual utility, is evident from the fact that the general introduction of manufactured articles is as often effected by extensive and judicious advertising, activity in putting the goods upon the market and large commissions to dealers, as by the intrinsic merit of the articles themselves. If the generality of sales were made the test of patentability, it would result that a person by securing a patent upon some trifling variation from previously known methods might, by energy in pushing sales or by superiority in finishing or decorating his goods, drive competitors out of the market and secure a practical monopoly, without in fact having made the slightest contribution of value to the useful arts. The very case under consideration is not

barren of testimony that the great success of the McClain pads and clasping hooks, a large demand of which seems to have arisen and increased year by year, is due, partly at least, to the fact that *he was the only one who made the manufacture of sweat pads a specialty, that he made them of superior quality, advertised them in the most extensive and attractive manner, and adopted means of pushing them on the market, and thereby largely increased the extent of their sales.* * * * While this Court has held in a number of cases * * * that in a doubtful case the fact that a patented article has gone into general use is evidence of its utility, it is not conclusive even of that, *much less of its patentable novelty.*" (Italics ours.)

To the same effect are the two later cases of this Court: Lovell Mfg. Co. v. Cary, 147 U. S. 623, 635, and Grant v. Walter, 148 U. S. 547, 556.

The explanation for the extensive use is found in the fact that, after 1900, the automobile came into prominence, and a gas package was peculiarly useful on automobiles. It is to be noted, however, that, at the present time, modern automobiles are electrically lighted. Although this fact is not in the record, it is one of which this Court has and can take judicial notice. Brown v. Piper, 91 U. S. 37.

THE POROUS FILLER OF FOUCHE MADE THE GAS TANK PRACTICAL.

There is, however, another factor which had great bearing on the success of the gas package as at present constructed by the complainants. This is the provision of a *porous filler* for the tank, which is embodied in United States patent No. 727,609, patented May 12, 1903, to E. Fouche, which patent is inserted at page 380 of the record, and is self-explanatory. The "Scientific American" heretofore referred to in referring to the history of acetylene storage, and more particularly Claude and Hess' gas package as illustrated in the patent in suit, reads as follows (Rec., pp. 434-5):

"The gas stored in this way is safe against explosion so long as the cylinder is full, but this process is open to one serious objection. Acetone increases in volume when it absorbs the gas. A cylinder having only forty-seven per cent of its volume filled with acetone at the beginning will be entirely filled with liquid when fully charged with the gas, and when the gas is escaping it shrinks, so that a cylinder which has been in use for some time will have a space at the top filled with gas under a dangerous pres-

sure. Under a pressure of ten atmospheres (150 pounds) the presence of the acetone is an element of safety, for the acetylene dissolved therein does not explode, but should the pressure be over twenty atmospheres (300 pounds) it does explode and add its heat of combustion to that evolved by the acetylene. While this process greatly reduced the chances of explosion, *still the use of acetone alone was too dangerous to make the process a commercial success.*

"A few years later *Edmound Fouche, of Paris, added the final element which made compressed acetylene a commercial possibility.* He first placed in the cylinder a filler of some inert porous substance, such as asbestos, infusorial earth, or charcoal, etc., and then added the acetone in which the gas was absorbed as before. In this way he prevented the existence of any considerable volume of compressed gas at any one point. In the illustration is shown one form of filler now in use. It consists of disks of asbestos entirely filling the cylinder. This filler decreases the gas holding capacity about twenty per cent, but its addition renders the gas entirely safe against explosion." (Italics ours.)

It is significant that the gas tank as now used by complainant contains this porous filler.

The Patent Is Void Because the Essence of the Invention Was Added by Amendment.

As construed by Judge Quarles, the patent in suit covers a gas package having a *supersaturated solution of acetylene in acetone as one of its essential elements.* In other words, the use of *acetone formed the essence of the invention* The original specification as filed read as follows (Rec., p. 390):

> "Contained within the reservoir is a fluid b capable of dissolving acetylene gas in accordance with a method set forth in our other application above referred to."

Of course, the method application contained both acetone and alcohol as solvents. There is, however, as contended by complainants, a great difference between an apparatus in which one of the elements is *any* solvent, and in which one of the elements is acetone. Now, Revised Statute 4892 requires that the *invention* of an application for a patent be sworn to. *The application, as originally filed, did not contain the essence of the invention* as contended by complainants. The mere ref-

erence to the co-pending application was not sufficient, as *Claude and Hess never did make an oath to the fact that they had invented a gas package in which one of the essential elements is a supersaturated solution of acetone,* or acetone as a solvent. Claude and Hess never even filed a supplemental oath supporting this fact, and the patent is, therefore, void, under the recent decision of this Court in Stewart v. American Lava Co., 215 U. S. 161.

DEFENDANTS DO NOT INFRINGE THE PATENT IN SUIT.

The Claims of the Patent in Suit.

Claims 1, 2 and 5 of the patent in suit contain the following limitations:

Claim 1; "and means for controlling said outlet, whereby the gas may escape therethrough at substantially *uniform pressure,* substantially as described."

Claim 2; "the package being provided at a point *above* the solvent with a *reducing-valve,* substantially as and for the purpose set forth."

Claim 5; "and a *reducing-valve* applied to an opening extending to the interior of the holder *above* the level of the solvent, substantially as set forth." (Italics ours.)

It will be noted that there are two limitations in these claims, first, the provision of a "*reducing-valve*", and, second, the positioning of the outlet *above* the level of the solvent. In accordance with complainants' construction throughout the litigation on this patent and the construction given by Judge Quarles, the *solvent is also restricted to acetone,* although this specific solvent is only mentioned in claim 5, and although, in accordance with the specification, the solvent is either acetone or alcohol.

REDUCING-VALVES.

We have heretofore given a general discussion of reducing-valves on page 3 of this brief. The definition given in the dictionaries are as follows:

> "Reducing-valve, a device for *automatically* maintaining a diminished pressure of steam, air, gas, etc., in a pipe, or other receiver, which is fed from a boiler or pipe in which the pressure is higher than is desired in the receiver." (Webster's International Dictionary, 1907.)
>
> "Reducing-valve, a spring or lever loaded valve, similar to a safety valve, whereby steam is maintained at a

lower pressure within a pipe than in the boiler which supplies it. Supposing the valve to be set at 60 pounds pressure, it remains open until the pressure in the pipe shall have arisen to that figure, when it closes, opening again as soon as the pressure begins to diminish and closing as it rises towards the upper limit." (Hawkins' Mechanical Dictionary.)

Defendants' experts give the following definitions and discussions:

"The fact is, as stated in the forepart of this affidavit, that the term 'reducing-valve' is only a technical term that means an *automatic* device, whereby the decrease of the gas or the like on one side of the reducing-valve will cause its automatic replenishment through the reducing-valve by reason of the diminished pressure upon that side, because of the decrease of the supply of gas on that side. This use of the term is ratified not only by the Century, Webster's and other dictionaries, but it is the uniform and universal sense in which that term is used in the specifications of patents and in mechanical descriptions generally, and it is never used in any other sense. *It is impossible, therefore, that a needle valve or any other non-automatic valve shall or can be the mechanical equivalent for a reducing-valve,* because it lacks the essential functional characteristic of a reducing-valve, namely, its automatic control of the flow of the gas or other liquid which it regulates, due to the automatic replenishment on the outer side of the valve of the store of gas on that side." (Mr. Hills, Record, p. 59.)

"*Reducing-valves have long been in use for special purposes,* such as in the case of the apparatus of the patent in suit, and are well known and understood in the mechanic arts. All valves are used to control the flow of fluids, gaseous or liquid, in passages, and all can be used in such a way, too, that the pressure of the fluid on the delivery side is reduced from, or less than, that on the supply side. But this does not by any means make a valve a reducing-valve, as the term is properly understood and used. Ordinary valves are *manually* operated; that is, the passageway of the valve is opened to its maximum limits or diminished to the point of closing, entirely by hand, and the *pressure of the fluid on the delivery side varies with the pressure on the supply side. A reducing-valve,* on the other hand, is *automatic,* or self-acting, in that the passageway adjusts itself to the varying pressure on the sup-

ply side in such a way as to keep the pressure on the delivery side substantially uniform. In other words, a *reducing-valve is an automatic equalizing valve*, and the term reducing-valve is always so understood in the mechanic arts." (Prof. Potter, Record, p. 67.)

"Authorities concur in saying that a reducing-valve is an automatic pressure regulator, one in which an automatic device regulates the pressure, whereby decrease in pressure of the gas on one side of the reducing-valve will cause its AUTOMATIC replenishment through the reducing-valve by reason of the diminished pressure upon that side.

* * * * * * * * *

"It is absurd to say that an ordinary valve is a 'reducing-valve' because when said valve permits the escape of some gas from a tank the pressure of the remainder of the gas in the tank is diminished or reduced. *If every valve is a reducing-valve, why the necessity of calling some valves 'reducing-valves' and others simply 'valves'?* (Mr. Ruess, Rec., pp. 130-1.)

"*Two kinds of valves* are the chief ones used for controlling the flow of gas: One is known as a *reducing-valve*, and the other is the *needle valve* to which I have referred above. There is no resemblance whatever between a reducing-valve and a needle valve, and by no stretch of the imagination can one be regarded as the mechanical equivalent for the other.

"A reducing-valve is characterized by three features: (1) it operates *automatically;* (2) it consists of a plurality of parts and is more or less complicated; and (3) the effect and object of its use is to maintain *steadily* a low pressure on one side of the valve when a high pressure is maintained on the other side. * * *

"A *needle valve,* on the other hand, has no automatic action. It *controls the flow* to a burner, but *not the pressure* in the supply pipe to several burners. It is a mere plug that stops a hole when closed and more or less opens the hole when moved away by hand." (Prof. Woodward, Rec., p. 136.)

It will be noted that Claude and Hess give the same construction to this technical term as do the definitions of the dictionaries and of the experts; thus, page 2, lines 13-20 of the patent describe the function of this reducing-valve as follows:

"It is obvious that through the agency of the *reducing-*

valve the pressure in said upper reservoir will be substantially uniform, so that the supply of gas in the pipes is properly controlled, the *pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted.*" (Italics ours.)

It will be noted that the device in question is designated in the Claude and Hess specification as "a reducing-valve d of any suitable or usual construction" (Specification, page 1, lines 97-8), and that a *distinction is drawn between an ordinary hand-operated valve, such as the "valve c*[3]*"* (Specification, page 1, line 90), *and the "reducing-valve* d".

The Invention Was Restricted During the Prosecution of the Application to the Use of a Reducing-Valve.

The original claims of the apparatus application included a "reducing-valve" either directly or by function (substantially uniform pressure). The amendment of August 23, 1897 (Rec., p. 397), contained the following claim:

> "1. A solution of acetylene contained in a closed vessel under pressure sufficient to maintain an excess of the gas dissolved, and means for permitting the excess of acetylene to escape from said solution by relieving or lowering said pressure, substantially as described."

It will be noted that the last element *does not call for a reducing-valve or its equivalent,* but that it is broad enough to cover any form of valve which will *simply "lower" the pressure of the escaping gas.* After the appeal to the Board of Examiners-in-Chief, however, where the Board suggested and allowed claim 1 of the patent in suit, and which claim corresponds to claim 3 of the amendment of August 23, 1897, the invention was again *restricted to a reducing-valve.* In the petition to the Commissioner to obtain the allowance of additional claims, the attorneys, in their brief, define the invention as follows (Rec., p. 418):

> "Briefly stated, the apparatus consists of a strong vessel having a horizontal diaphragm provided with an opening controlled *by an automatic pressure regulating valve* —that is to say, by a valve which opens less or more according as the pressure is greater or less, and thus maintains a practically constant outflow of gas at a pressure but slightly above that of the atmosphere. The vessel is *further* provided with a *cock* closing the upper chamber into which the gas enters through the automatic valve, so

that delivery of gas may be wholly cut off if desired. * * *" (Italics ours.)

It is to be noted that the *method and apparatus applications were considered together by the patentees and the Patent Office,* as will clearly appear from the brief before the Commissioner (Rec., p. 296):

> "*This case may be conveniently considered in connection with* the brief submitted in the companion case, No. 625,580, covering the apparatus preferably employed in carrying out this method." (Italics ours.)

In the brief before the Examiners-in-Chief, in the method application, appears the following statement (Rec., pp. 289-290):

> "The fact that other things had to be done, that special adaptation and arrangement of apparatus had to be made in one or another form—or in other words, that *some form of pressure reducing and controlling device* must be used between the storage chamber and the point of use, shows that others had stopped short of the discovery or invention here involved."

That the Patent Office also considered the reducing-valve as a restriction of the claims clearly appears from the decision of the Examiners-in-Chief in the method application, as follows (Rec., p. 292):

> "His present invention consists in releasing such gas through a pressure regulator,"

and from the decision of the Commissioner (Rec., p. 299). In fact, the *patentees, in the method application, requested permission to illustrate the reducing-valve* (Rec., p. 296), *although the apparatus in the method application clearly disclosed an ordinary hand-operated valve which would lower the pressure of the escaping gas in the same manner as a needle valve.* It is to be noted that the Commissioner refused this, holding that this would involve new matter (Rec., p. 300).

It is, therefore, entirely clear that *all through the proceedings in the Patent Office of the apparatus and method applications, the reducing-valve was construed in the ordinary way, as known in the arts, and was given the ordinary meaning,* otherwise, why should an illustration be necessary in the method application when a manually operated valve was shown?

It is well settled that, if an applicant cancels or restricts a claim during the prosecution of the application in the Patent Office, and thereby acquiesces in the restriction of the claim, he cannot afterwards construe the claim as broad enough to cover the subject-matter of the claim before it was restricted, and he cannot afterwards say that the restrictive meaning, given a claim in the Patent Office in order to obtain its allowance, is not the meaning to be given the same in the courts. Kokomo Fence Machine Co. v. Kitselman, 189 U. S. 8; Sutter v. Robinson, 119 U. S. 530; Electric Co. v. Boston Co., 139 Fed. 481; Coto Waxo Chemical Co. v. Perolyne Co., 185 Fed. 267.

In the Kokomo case this Court, in discussing this point, speaks as follows:

> "Kitselman acquiesced in the rejection and withdrew his nineteenth original claim, and cannot now reasonably claim a construction which would protect his machine as a pioneer field-machine.
>
> * * * * * * * * *
>
> "In view of what passed in the Patent Office, and the state of the art, we cannot regard the Kitselman patent as a pioneer patent, but think its claims must be limited in their scope to the actual combination of essential parts as shown, and cannot be construed to cover other combinations of elements of different construction and arrangement."

The expressions *"substantially as described", "substantially as and for the purpose set forth", and "substantially as set forth", moreover, restrict these claims to the use of a reducing-valve having the function described in the specification.* Westinghouse Air Brake Co. v. Boyden Brake Co., 170 U. S. 537; Jewell Filter Co. v. Jackson, 140 Fed. 340; Brill v. St. Louis Car Co., 90 Fed. 666. In the last case the Court, in discussing this case, speaks as follows:

> "The words 'substantially as set forth' with which this claim concludes, refer to the specification, and make the description of the housings therein contained an essential part of the claim. * * * Generally, language in a claim which points to an element or device more fully described in the specification is limited to such element or device as there described."

DEFENDANTS' TANK HAS A NEEDLE VALVE WHICH IS NOT A REDUCING VALVE.

Now *defendants' tank is provided with a needle valve. A needle valve is not a reducing-valve. It will not so control the gas that the pressure will be "substantially uniform * * * the pressure being substantially the same when the receptacle is fully charged as when it is nearly exhausted"*, but the pressure will *gradually decrease* from a maximum when the tank is full to a minimum when the tank is nearly empty. This is clearly shown in the illustration opposite page 447 of the record, which represents the difference in the flame, when the pressure drops from 203 to 101 pounds per square inch (Record, p. 448). Complainants cannot argue that an ordinary valve will be satisfactory with the conditions encountered in an automobile, where only two small jets are used for a few hours, and where it is not objectionable if the lights die down. Admitting that an ordinary valve will maintain the pressure satisfactorily for a certain class of lighting, this is, however, due to the *relation of the quantity of gas stored and the rate of consumption.* This is true everywhere that gas is used. Thus, a gas well having an enormous quantity of stone gas will discharge the gas through a large pipe for a long time without an appreciable diminution of pressure at the outlet, because of this relation between the volume of the gas and the rate of discharge. Moreover, it may not be necessary to use any valve at all, but simply connect the pipe directly to the tank and regulate the flame at the gas jets. The point to be kept in mind, however, is that *Claude and Hess, in their patent, provided a certain valve for the purpose of keeping the light steady, and the claims are restricted to the use of such a valve. Claude and Hess deliberately canceled a claim which did not contain this specific limitation, and they are, therefore, restricted to the use of a reducing-valve.* They cannot now say that such a limitation is not material. It is to be noted that Claude and Hess designed their tank for a residence, not for an automobile.

A needle valve is just like any manually operated valve, the sole difference being that it is adjusted by a screw, and it can, therefore, be *adjusted more accurately.* It *does not, however, after being once set, maintain a uniform pressure* any more than any other hand-operated valve or cock, or in fact any more than any opening connected directly to the pipes without any valve except those at the jets, as in a residence. It is true, as stated above, that it is accurate enough for certain purposes, but the same is true for any valve. It will not, however, maintain a uniform pressure, and it would not

do in a residence (contemplated by Claude and Hess) where there are half a dozen large lights. In such a case the ordinary tank used on automobiles would require an adjustment of the valve every hour.

THE FACT THAT A NEEDLE VALVE IS SUFFICIENT FOR AUTOMOBILE TANKS DOES NOT MAKE IT AN EQUIVALENT.

The opinion of Judge Quarles in Commercial Co. v. Avery, *supra*, that the tank in an automobile is put "to a special use where no automatic control is neither necessary nor desirable", is not in point. According to this view, where, for instance, only little gas is necessary, the acetone could be omitted and a porous filler substituted, and the tank without the solvent would then still infringe. This process of elimination of essentials could be carried on *ad infinitum*. This, of course, is absurd. The Court cannot say that acetone, with which only one of the solvents mentioned, is the essential element, any more than the pressure regulator, for the reason that, *in a combination claim all elements are on the same footing*, and all are presumed to be material (Leeds & Catlin case). In this case, however, by cancellation and restriction, *the pressure regulator as a device for delivering the gas at a "uniform pressure" was made an essential element of the claim.*

In the case of Commercial Acetylene Co. v. Searchlight Gas Co., 197 Fed. 908, the Court discusses this point, on final hearing, as follows:

> "It is apparent, from the drawings of the patent in suit herewith produced, that the automatic reducing-valve is an *essential* element of complainant's combination, and a necessary feature in securing the *uniform pressure* called for in claim 1 in discharging the gas.
>
> "Defendants employ *no reducing-valve such as contemplated in the patent in suit.* They do not provide for *uniform pressure* of the escaping gas. They deliver the gas to the burner or receptacle directly from the storage tank, regulating the volume of the flow by a cock or valve, preferably a *needle valve. No attempt is made to secure a uniform pressure.* Complainants, it is said, now use no reducing-valve, but employ a needle valve. This form of valve is very old, it was held by Judge Quarles, in Commercial Acetylene Co. v. Avery Portable Lighting Co. (C. C.), 166 Fed. 907, that the needle valve was the equivalent of the reducing-valve, and that construction seems to have been placed upon the two parties by several of the courts in the Sixth Circuit. The specification and

drawings of the patent in suit show a valve c3 in the outlet pipe c, above the reducing-valve. This corresponds to defendants' outlet valve. In the patent, it is assigned no other function than to close the receptacle, and 'be opened after the receptacle is properly coupled for use'. Thus, the only service of the valve c in the device in suit is to confine the gas to the receptacle when not in use. Presumably, the gas in the tank above the reducing-valve is at uniform and usable pressure. The volume is not diminished, only the pressure." (Italics ours.)

It will be noted that in that case the defendants' tank was provided with a needle valve, and otherwise practically the same as the Prest-O-Lite tank.

IN DEFENDANTS' TANK THE OUTLET IS NOT POSITIONED ABOVE THE SOLVENT.

In the patent tank the outlet is *above* the solvent, and it is so limited in claims 2 and 5. The specification also describes this construction as an essential when it says, page 1, lines 26-31:

> "To this end the apparatus embodying the present invention consists, *essentially*, in a closed receptacle containing avetylene gas in solution and having an outlet for the gas so positioned as to be *normally above the level* of said solution." (Italics ours.)

The reason, of course, is that on account of acetone being a liquid, it will pass through the valve if the outlet is at any place except the top. The "Scientific American" says (Record, p. 434):

> "In all cases where acetone is used, the valve must be kept at the top to prevent its escape."

It is also interesting to note that this is even followed in the present Prest-O-Lite tank, where the outlet is near the top, and where the tank bears the notice "THIS SIDE UP". Now, *in defendants' tank, the outlet is at the center, and not at the top. This is due to the fact that defendants use a new solvent, namely, "Terpeline"*, which, being more viscuous and having a higher specific gravity, is better taken up by the porous filler, and is not blown out (Record, p. 143).

DEFENDANTS' TANK DOES NOT CONTAIN ALCOHOL OR ACETONE AS A SOLVENT, BUT CONTAINS A NEW SOLVENT, "TERPELINE".

Dr. Born, the inventor of Terpeline, on page 142 of the record, and Prof. Potter, on page 208, give the characteristics of Terpeline as compared with acetone, and these characteristics are summed up below in a table:

Comparative Properties of Acetone and Terpeline.

Property.	*Acetone.*	*Terpeline.*
Absorption at 1 atmosphere	22 volumes	25½ volumes
Absorption at 12 atmosphere	264 volumes	306 volumes
Mixed with air	inflammable	non-inflammable
Odor	pleasant	unpleasant
Specific Gravity	0.790	1.14
Normal state	volatile non-viscuous	non-volatile viscuous
Blowing	yes	no
Carbon deposits	yes	no
In tank	gravitates to bottom	does not gravitate to bottom
Tank outlet	at top	anywhere
Evaporation	considerable	practically none
Heat developed by absorption of acetylene	considerable	very little
Flame	.....	Whiter than when using acetone

Both Dr. Born and Prof. Potter, as well as Dr. Lukens, the vice-president of the defendant company (Record, p. 168),

positively state that Terpeline is not acetone or alcohol. Furthermore, *Prof. Potter states* (Record, p. 209) *that he has personally tested defendants' tank No. 963 (which Dr. Ruess, complainants' expert, states that he found to contain acetone), and that the said tank No. 963 did not contain any acetone, but contained Terpeline.* Professor Potter, who is a Consulting Chemist, and has been for forty years, says that *the test reactions for acetone are given by other substances than acetone,* but that the characteristics (as pointed out in the table above) of Terpeline are entirely different from those of acetone. *It is significant that complainants have not been able to prove that defendants have purchased an ounce of acetone.* Complainants and Judge Quarles in Commercial Acetylene Co. v. Avery, construed the claims as restricted to acetone as a solvent. Now defendants employ a new solvent, as indicated by its characteristics. *If the claims must be limited to acetone, how can a new solvent be an infringement, especially if the new solvent possesses new characteristics?* The law is to the effect that it is no infringement (30 Cyc 982).

Defendants' Patent.

Defendants' patent No. 987,000 is inserted opposite page 430 of the record. The invention is stated as follows, page 1, lines 9-18:

> "This invention relates to valves and has for its object to provide a valve which is adapted to control the passage of gas or liquid from a reservoir and which is particularly intended to be used to control the passage of acetylene or other gas from a reservoir in which the gas is stored or generated for the purpose of supplying the lamps of an automobile, railway coach, headlight of a locomotive, boat, etc."

Now, it is well settled, by the decisions of this Court and of the Federal courts, that, *where there has been a patent granted to the defendant "the presumption from the grant of the letters patent is that there was a substantial difference between the inventions".* Kokomo Fence Machine Co. v. Kitselman, 189 U. S. 8; Boyd v. Tool Co., 158 U. S. 260; Livingston v. Wordsworth, 15 How. 546; Corning v. Burden, 15 How. 253; Pavement Co. v. City of Elizabeth, Fed. Case No. 312; Powell v. Leicester Mills Co., 103 Fed. 476; St. Louis Car Coupler Co. v. Malleable Castings Co., 87 Fed. 885; Illinois Steel Co. v. Kilmer Mfg. Co., 70 Fed. 1012; Ney Mfg.

Co. v. Superior Drill Co., 56 Fed. 152; Kohler v. George Worthington Co., 77 Fed. 844.

In this case the patent is not for a detail of construction, which is immaterial in this case, but it is for a *new valve needle structure which is essentially distinct and different from a reducing-valve,* which latter is set forth as an *essential element* of Claude and Hess' patent.

DECISION OF CIRCUIT COURT OF APPEALS, EIGHTH CIRCUIT.

The Court did not really pass upon any points except the discretion of the lower court in granting the order issuing the injunction, and it is, therefore, not profitable to discuss the same. This refusal of the Appellate Court to go into the merits of the case has caused unnecessary hardship. While the granting or withholding of an interlocutory injunction is unquestionably within the discretion of the lower court, *the lower court must follow established rules* and must, moreover, render a decision upon the merits. It must not refuse to render a decision upon the merits because the matter is to be left for the review of the Appellate Court as appears from the petition for the writ of *certiorari* Those rules are: First, *There must have been a prior adjudication* (which means on all defenses). Second, *The infringement must be clear.* Neither of these appeared here with the required certainty to warrant the granting of the issue of this extraordinary writ. It is true, the patent had been sustained, but the prior defense of expiration had not been brought forward in the main case in which there had been the prior adjudication. It is true that the patent had been sustained in Commercial Acetylene Company v. Acme Company, where the defense of expiration was disposed of, but the opposite view was taken by the Court in the Searchlight Company case, which, although only on the motion for a preliminary injunction, was nevertheless the best considered of the two. Moreover, the *infringement was not by any means clear.* Judge Quarles, in the Avery case, restricted the patent to acetone as a solvent. *If there was conflict of opinion as to whether defendant really used acetone as a solvent, since the burden was on complainant to prove infringement, the Court should have refused the writ.* Moreover, at that time, defendant was operating under a patent for an essential part of the apparatus. The Court should, therefore, have refused to issue the preliminary injunction. (Goodyear v. Dunbar, 1 Fischer Pat. Cases 472, and Pavement Company v. City of Elizabeth, 4 Fischer Pat. Cases 189.)

THIS COURT CAN DISMISS THE BILL AT THIS HEARING.

In Mast, Foos & Company v. Stover Mfg. Company, 177 U. S. 485, this Court dismissed the bill of complaint on a hearing before this Court on *certiorari*, where the Circuit Court of Appeals reversed the lower court on an order granting preliminary injunction, and there are a large number of cases where this Court has dismissed a case upon a hearing upon a Bill and Answer. This Court refused to do so in the Leeds and Catlin case, but this was for the reason that the record was complex and rested mostly upon affidavits of public use. While the present record contains affidavits of experts and prior use, the case has been presented in this Brief so as to rest the same upon *matters of record*, such as patents and printed publications, all of which are certified to by the heads of the Patent Offices of the United States and Foreign Countries. It would have been very easy for complainants to have disproved these records, and it is significant that they have not done so, although they have presented affidavits in reply. There can be no conflict of records in this matter, especially on the expiration and invalidity of the patent. There can be no conflict on the construction of claims, whether or not they include a reducing valve as an essential element. There can be no conflict as to the construction given the claims of the patent in suit by the patentees and the Patent Office. There can be no conflict as to whether defendants, or even complainants, use an apparatus which is within the terms of the patent in suit. *The invention is characterized by extreme simplicity, and the Court does not need experts to explain its construction and operation.* In this Brief counsel has refrained from citing experts, but has presented the matter to the Court in a common-sense way in view of the extreme simplicity. The only conflict is whether the defendants use acetone, and as to this, the surrounding circumstances, apart from the testimony, are sufficient to determine this question. Moreover, it is to be remembered that *infringement must be clearly proven*, and the burden as to this is upon complainants. *If there is conflict, then infringement is not clear*, and the matter should be left until final hearing. No injunction should, therefore, have been issued, and the injunction in any case should be dissolved.

CONCLUSION.

I. The patent in suit expired with the British and French patents, before the filing of the bill, and the bill should, therefore, be dismissed.

II. The patent in suit expired with the German patent before the granting of the order issuing the injunction, and the order was, therefore, improperly granted and should be dissolved.

III. The patent in suit is invalid.

1. Because it is for an aggregation, and not for patentable subject-matter under the law.
2. Because it is anticipated by the prior art.
3. Because the essential feature was added by amendment, and the combination of the present alleged invention was, therefore, not supported by an oath as required by law.

IV. The defendants do not infringe.

1. Because they do not use a reducing-valve.
2. Because they do not locate the outlet above the solvent.
3. Because they do not use acetone.
4. Because they use a patented valve construction, which is not a reducing-valve and is not the equivalent of the valve of the patent.

V. The bill should be dismissed at this hearing.

VI. The order granting the preliminary injunction should be dissolved.

1. Because patentability is not free from doubt.
2. Because infringement is not clearly proven.

Respectfully submitted,
JOHN H. BRUNINGA,
Counsel for Petitioners.

St. Louis, Mo., September 30, 1915.

INDEX.

	PAGE
Introduction	1
First Point. The term of the U. S. Claude & Hess patent in suit was not limited by the expiration of any foreign patents granted to Claude & Hess	2
Statute Section 4887	3
Argument on the question of the valve	9
More specific argument	10
British Claude & Hess patent	11
French Claude & Hess patent	14
German Claude & Hess patent	15
Summary of foreign patents	17
Discussion as to limitation by foreign patents	23
Second Point. The apparatus of Petitioner infringes Claims 1, 2 and 5 of the patent in suit	32
Defendant's valve	32
Defendant's solution	34
Defendant's package	35
Third Point. The claims in issue are not invalid for lack of patentable novelty	36
(*a*) The patented invention	36
(*b*) The prior art	41
Fourth Point. Miscellaneous	43
(*a*) The patent is not void "because the essence of the invention was added by amendment"	43
(*b*) Bearing of porous filler	45
(*c*) Invention not a mere double use of prior art	48

PAGE

(*d*) Patent is not for an aggregation 49

(*e*) Defendant's needle-valve is the equivalent in defendant's device of the reducing valve of the patent in suit 49

(*f*) General considerations 57

(*g*) No abandonment of the invention of Claude & Hess 60

(*h*) Bill should not be dismissed unless patent in suit had expired prior to filing bill 62

INVENTION OF THE PATENT IN SUIT 62

CONCLUSION 64

Table of Cases Cited.

PAGE

Acme Acetylene Co. vs. Commercial Acetylene Co., 192 F., 321 ..... 2, 9, 21, 25, 60

Burns vs. Meyer, 100 U. S., 671 ..... 4, 26

Century Electric Co. vs. Westinghouse Electric Co., 191 F., 350 ..... 8, 17, 30

Commercial Acetylene Co. vs. Avery Portable Lighting Co., 166 F., 907 ..... 36, 37, 42, 46, 48, 57

Commercial Acetylene Co. vs. Autolux Mfg. Co., 181 F., 387 36

Commercial Acetylene Co. vs. Schroeder, et al., 197 F., 908 2

Commercial Mfg. Co. vs. Fairbanks, 135 U. S., 176 20

Fireball Gas Tank Co. vs. Commercial Acetylene Co., 198 F., 650 2

Holmes vs. Metropolitan Co., 22 F. 341 ..... 4, 26

Keystone Bridge Co. vs. Phœnix Iron Co., 95 U. S. 271 26

Leeds & Catlin vs. Victor, 213 U. S. 301 ..... 4, 6, 7, 17, 23, 40

Lourie Implement Co. vs. Lenhart, 130 F. 122 34

McMillan vs. Rees, 1 F. 722 ..... 4, 25

Paper Bag Case, 210 U. S. 405 40

Pohl vs. Anchor Brewing Co., 134 U. S. 381 5

Railroad vs. Mellon, 104 U. S. 112 ..... 4, 25

Robinson on Patents, § 623 4

Sawyer Spindle Co. vs. Carpenter, 133 F. 238 20

Sewall vs. Jones, 91 U. S. 171 34

Siemens vs. Sellers, 123 U. S. 276 ..... 7, 20, 23

Stewart vs. American Lava Co., 215 U. S. 161 45

Thomson vs. McLean, 153 F. 883 20

Toohey vs. Harding, 1 F. 174 26

Yale Lock Co. vs. Greenleaf, 117 U. S. 554 26

Western Electric Co. vs. Citizens, etc., 106 F. 215 20

Westinghouse vs. Stanley Co., 138 F. 823 ..... 4, 21, 26

White vs. Dunbar, 119 U. S. 47 ..... 4, 26

IN THE

Supreme Court of the United States.

OCTOBER TERM, 1915.

FIREBALL GAS TANK AND ILLUMINATING COMPANY and DAVID LEON SOLOMAN, Petitioners, vs. COMMERCIAL ACETYLENE COMPANY and the PREST-O-LITE COMPANY, Respondents.	No. 89.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE EIGHTH CIRCUIT.

BRIEF FOR RESPONDENTS.

The attacks upon the lower Court's decision fall under the following heads:

1. *Expiration of the patent in suit by reason of the expiration of prior foreign patents for the alleged same invention;*
2. *Non-infringement;*
   (*a*) because of the valve,
   (*b*) because of the solvent,
   (*c*) because of location of valve relatively to the level of the solvent.
3. *Lack of patentable novelty;*
4. *Miscellaneous.*

We discuss these attacks in the order named, the first, obviously, lying at the base of the whole case, for if the patent in suit had already expired there was and is no case.

FIRST.

The term of the U. S. Claude & Hess patent in suit was not limited by the expiration of the term of any of the foreign patents granted to Claude & Hess.

The Court of Appeals for the Sixth Circuit held that the term of the patent in suit was not limited by the prior British patent to Claude & Hess because of lack of identity of patenting, the British patent being for a process, the U. S. patent for an apparatus.

Acme Acetylene Co. vs. Commercial Acetylene Co., 192 F., 321.

The Court of Appeals for the Seventh Circuit held the contrary.

Commercial Acetylene Co. vs. Schroeder, et al., 197 F., 908.

The Court of Appeals for the Eigthth Circuit, while reserving its opinion on all questions except the question of abuse of discretion in granting the injunction, substantially discussed the expiration of term question, following the above cited Court of Appeals for the Sixth Circuit decision (the Seventh Circuit decision not then having been made) as to the British patent and as to the German Claude & Hess patent stated that "its terms are much less favorable to the contention that it is a patent for an apparatus than are those of the British patent" (p. 655).

Fireball Gas Tank Co. vs. Commercial Acetylene Co., 198 F., 650,

being the case for which the writ herein was granted.

The contention of the defendants on this point is that the invention patented by the patent in suit is identical with the inventions patented by foreign patents granted to these same inventors prior to the granting of the patent in suit, and that under Section 4887 of the United States Revised Statutes, the term of the patent in suit ended with the expiration of the earliest expiring foreign patent.

Section 4887 of the Revised Statute of the United States under which this controversy arises, reads (italics ours):

> § 4887. "No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application. But every patent granted for an invention *which has been previously patented* in a foreign country shall be so limited as to expire at the same time with the foreign patent or if there be more than one, at the same time with the one having the shortest term and in no case shall it be in force more than seventeen years."

The question of expiration is a different question from the question of patentability. It is to be considered from a different point of view. The question of identity of the patent with other patents has nothing to do with the question of its patentability. The patentability of the invention is measured by the conditions as they exist at the time the patent is applied for, and the existence of any number of patents, whether for the same article, or for similar articles, so long as those patents were issued to the same inventors as were applying for the United States patent within the time limited by the statute, could make no difference as to patentability.

The question of the expiration of the patent in suit with the expiration of prior foreign patents issued to the same inventors, rests on a question of identity of things patented,

which does does not enter into the question of patentability.

The term of the United States patent is limited only by the thing *patented* by the foreign patent, not by the things *disclosed* therein.

Holmes vs. Metropolitan Co., 22 Fed., 341.
Leeds & Catlin vs. Victor, 213 U. S., 301.
Westinghouse vs. Stanley Co., 138 Fed., 823.
Robinson on Patents, § 623.
McMillan vs. Reese, 1 Fed., 722.
Railroad vs. Mellon, 104 U. S., 112.
White vs. Dunbar, 119 U. S., 47.
Burns vs. Meyer, 100 U. S., 671.

It seems sometimes to be thought that if an invention becomes free to the people of a foreign country by reason of the expiration of a patent, it therefore, by that mere fact, becomes free to the people of this country, irrespective of the character or expiration of such foreign patent; and that in recognition of this fact Congress passed a statute limiting the term of a domestic patent to that of the shortest term of a foreign patent for the same invention previously issued, and that the Courts have interpreted that statute in the light of this theory.

Assuming that Congress passed this statute on that theory, the Courts very soon recognized its fallacy and saw that if an inventor never took a patent in a foreign country, but took one out in the United States, his invention was always free to the people of a foreign country, and could never become free to the people of this country until the expiration of the normal term of his United States patent. Or, if he took out his patent in this country first, and then took his patent out in foreign countries immediately after, if the term fixed by the laws of the foreign countries was short enough to terminate before the term of the United States patent, the invention would become free to the people of a foreign country and not to people of this.

This recognition of the fallacy of the theory on which the

statute may be assumed to have been founded was forced upon the Courts when it was contended that the term of a United States patent had terminated with the expiration of a foreign patent which had lapsed long prior to its normal term by reason of non-payment of fees, or for some other like reason.

It was argued in such a case to the Court that since the invention had become free to the people of a foreign country by reason of the expiration of a foregn patent, it therefore should become free to the people of the United States, and came within the meaning and spirit of the statute. The Court then recognized the fallacy of the theory, and decided that the United States patent existed for the normal term of the foreign patent, and was not affected by the lapsing of the foreign patent before its normal term (*Pohl vs. Anchor Brewing Co.*, 134 U. S., 381).

There were several of these decisions, and Congress itself then recognized the fallacy of the theory on which it had passed the statute, and on March 3, 1897, amended it so as to do away with the dependence of domestic patents on the term of prior issued foreign patents. This was further recognized by practically all civilized countries when, in 1903, by the Brussels Treaty, it was expressly agreed that the patents in each country should be independent of the term of the patents of other countries.

Since the passage of this statute under which it is claimed the patent in suit has expired, there has been a constant tendency of the Courts to construe the statute, where it was brought in question, in favor of the continued existence of the domestic patents, and the cases are full of expressions by the Courts in which they say that every presumption should be resolved in favor of the American patent.

The construction of this statute on the question of identity was before a great many of the Circuit Courts of Appeals, and there was considerable confusion as to what constituted a test of identity between the domestic and foreign patents. In

some cases it was held that if the main and principal invention was present in each patent, they were identical. In others it was held that if one patent would infringe the other, they were identical within the meaning of the statute.

This was the condition when the case of *Leeds & Catlin vs. Victor Talking Machine Co.*, 213 U. S., 301, was brought to this Court on a writ of *certiorari*. And the Court, in that case, laid down the rule which is the test of identity. That rule, as we understand, is: That the *thing patented* must be the same in both patents.

It is with diffidence that the *Leeds & Catlin vs. Victor* case is here discussed. Our apology must be to point the parallel of the case at bar to what we have understood to be the doctrine of *Leeds & Catlin vs. Victor*.

It appears from the reading of the opinion that the Court uses the term "thing patented" in the Patent Office sense, in the technical sense. And in the holding as to what is *not* the same thing patented, it was stated that "a process and an apparatus by which it is performed are distinct things" (p. 318).

It was also held that a combination of elements is distinct from its elements (p. 318). In other words, this Court, in order to limit the effect of the harsh statute founded upon a false theory—a theory which had been recognized as false by the Courts and by Congress and by the nations—adopted, in order to protect the patents still affected by this repealed statute, insofar as it properly could, a strict and technical construction of the statute in favor of the domestic patent.

We do not contend in this case that the principal discovery is not present in both the British (for instance) and the United States Claude and Hess patents. This discovery of the solubility of acetylene in acetone is the foundation of the British patent and it is the foundation of the American patent. But, as said by the Court in the *Leeds & Catlin vs. Victor* case, the fact that "the most important part" (p. 320),

is present in both patents is not a conclusive test. If the patents are for the same thing it probably would be a conclusive test, as in the case of *Siemens vs. Sellers* (123 U. S., 276), but where the patents are for two different things within the meaning of the statute, the presence of the principal discovery in both does not make them identical.

> "A process and an apparatus by which it is performed are distinct things," *Leeds vs. Victor* (p. 318).

This is shown by the specific patents which were considered in the *Leeds & Catlin vs. Victor* case. The sound-reproducing apparatus is the foundation of the phonograph; it could not exist without it. Yet in the *Leeds & Catlin vs. Victor* case, where the German patent covered the sound-reproducing apparatus and the United States patent covered a process for reproducing sound using such apparatus, the Court says the sound-reproducing apparatus was the foundation of both patents, but they were not for the same thing, were not identical as patents because a patent for a process is not the same thing as a patent for an apparatus.

So, too, the test as to infringement does not hold good. If the patents are for the same thing the test of infringement would perhaps be a good one, but where the patents are for different things it is not a correct test. This is shown also in the *Leeds & Catlin vs. Victor* case. The German patent there, as said before, covers the sound-reproducing apparatus.

> "The instrument is exhibited by a drawing and is specifically described" (*Leeds vs. Victor*, p. 320).

The United States patent in one of its claims covered a combination of which the sound-reproducing apparatus was an element, and in spite of the fact that the inventor himself had claimed and said that the sound-reproducing apparatus was the principal element of his combination in the United States patent, the Court said they are not the same thing, because

an element of a combination is not the combination, nor are all the elements of a combination the combination, and that a patent on the combination is not identical with a patent for one of its elements. The article patented by the United States patent would undoubtedly have infringed the German patent in a case where infringement was the issue, because if in making the article covered by the United States patent they had used the sound-reproducing apparatus which was the thing covered by the German patent, they would necessarily have infringed the German patent by such use.

So in the patent considered in the *Leeds & Catlin vs. Victor* case, the test of whether the same invention was in both, and the test of infringement would, either one, have defeated the United States patent if applied. But, as said before, this Court limited the operation of the statute to identity of *thing* patented, and construed the thing patented in the technical sense used in the Patent Office. What that sense is, is illustrated in a recent case, *Century Electric vs. Westinghouse Electric Co.*, 191 Fed. Rep., 350, where the contention was that two patents, one for the process and the other for the apparatus, were for the same invention, and, therefore, the latter was void. And the Court there held that they were not the same *thing*, and that one who discovers an art, and invents a machine to practice it, does not deprive himself of a right to patents on both the process and apparatus.

We do not contend that these patents are differentiated by the mere valve. We contend that the British patent is for a process, and the United States patent is for an apparatus, and that even the apparatus *disclosed* in the British patent, but not *patented* thereby, is merely an element in the apparatus in the United States patent, and that, therefore, under the ruling in the *Leeds & Catlin vs. Victor* case, neither the British patent nor the German patent to Claude & Hess is identical with the patent in suit.

In looking at all the Claude and Hess foreign patents, it is

obvious, as said by the Circuit Court of Appeals for the 6th Circuit, in *Acme Acetylene Appliance Co. vs. Commercial Acetylene Co.*, 192 F., 321, that the inventors in taking out their foreign patent were only concerned with patenting the method or process of storing their acetylene, and were not considering the proposition of patenting a package which was ready to be immediately attached to the burner and used to deliver the gas without further attachments. The inventors themselves showed this when in their applications for their patents in the United States Patent Office the oath (T. R., p. 263) to the application for the *process patent* sets forth that they had already taken out a patent for this method in France, but in their oath (T. R., p. 393) to the application for the *apparatus patent*, which ripened into the patent in suit, they state that this invention has not been patented "in any country," showing that they themselves understood the distinction as to their foreign patents.

This is further shown in the German patent, where they expressly state in the specifications that the apparatus described in the specification is "only given by way of example for explaining the process" (T. R., p. 207).

The argument on the question of the valve, so far as this part of the brief is concerned, goes merely to the proposition that in order to make the gas package embodied in the United States patent a practical and useful article, the valve, as a means for controlling the pressure of the gas, is a necessary element in the combination, and that the package as conceived by the inventors, to effectuate the purpose for which it was conceived, must necessarily have, as an integral part of it, a means for controlling the escape of gas at substantially uniform pressure. It is not the principal part, and is not *the invention*, but it is a necessary part, as every element in every combination invention is conclusively presumed to be necessary, as a matter of law. It has its purpose in this package as the other elements have. To effectuate the main

purpose and reason for being of this package that valve coacts with every other element of the combination. It does not constitute the invention of the combination, but is necessary to effectuate the purpose of the combination. The absence of this valve in the claims of the foreign patents, as an element thereof, demonstrates that the inventors did not have in mind to patent the complete package embodied in the United States Letters Patent. If they had, they would have included the valve as an element in the combination. They knew of the valve, and they have *disclosed* the valve in their description of an apparatus which might be used, but they have not *patented* any combination which includes a valve as an integral part thereof, and this is true of every one of the foreign patents. They exclude the valve as an integral part of the invention claimed and patented.

So, it being shown that the foreign patents are patents for a process, or method, and that the United States patent is a patent for an apparatus, within the ruling of the *Leeds & Catlin vs. Victor* case, as we interpret it, they are not patents for the same thing, and the United States Letters Patent are not limited by the terms of the foreign patents.

To make our argument more specific:

The claims of the United States Claude & Hess letters patent involved in this case are (italics ours):

> "Claim 1. *A closed vessel* containing a supersaturated solution of acetylens, produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet, whereby the gas may escape therethrough at substantially uniform pressure, substantially as described.
>
> "Claim 2. *A prepared package* consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by

said solvent under pressure, and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a reducing valve substantially as and for the purposes set forth.

" Claim 5. *As a new article of manufacture*, a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, substantially as set forth."

The British Claude and Hess patent (T. R., pp. 333, 335) is a patent for a method. Its title is " An Improved Method of Storing Acetylene for Lighting and other Purposes ". The claims also establish this (T. R., p. 337):

" 1. The utilization for the purpose of storage, in a small volume, of large quantities of acetylene gas, of the solubility of said gas in certain liquids by the application of pressure, so as to increase the quantity of gas dissolved per unit of volume of liquid as specified.

" 2. The novel application as solvents of acetylene under pressure for the purpose of storage, transport and utilization for industrial purposes of the bodies contained in the following groups belonging to the fatty series: liquid hydrocarbons, acetylenic hydrocarbons, and the chloro bromo iodo and nitro derivatives of said hydrocarbons, as well as the lower members of the acids and ocy-acids, and their solutions; aldehydes, monhydroxyl alcohols, and unsaturated alcohols of the fatty series; ethers (oxides, cyanides, cyanates).

" 3. The novel employment as solvents of acetylene under pressure for the purposes of storage, transport and industrial utilization of the following groups of bodies belonging to the aromatic series—benzenic hydrocarbons (benzene, toluene, xylene, etc.), choloro, bromo, iodo, and nitro derivatives of said hydrocarbons; phenols, aromatic amines (aniline, toluidine, etc.).

" 4. The novel application as solvents of acetylene

under pressure for the purposes of storage, transport and industrial utilization of the following groups of bodies belonging to the higher series—liquid hydrocarbons and their derivatives (trimethyline, furfuring, thiophenol, pyrrol, furfurol, essences, etc.).

"5. The application for the same purposes of mixtures of combinations of the bodies specified.

"6. The employment of a receiver containing a liquid charged with acetylene under pressure, and from which the acetylene is evolved when required for use as specified.

"7. The herein described method of storing acetylene gas in a small volume for lighting or other purposes, which consists in dissolving the acetylene gas under pressure in a suitable liquid solvent such as described, from which it can be evolved when required for use."

The British patent is a patent covering a method or process; the United States is a patent covering means, a combination, which includes as one of its elements the product of the method of the British patent. And the same is true of the French, and German patents.

They all profess to be patents for a method or process or system and while the specifications of these patents disclose, more or less completely, an apparatus for employing the process, such apparatus is not claimed as such in any of the patents. One claim, the 6th in the British mentions a receiver in connection with the supersaturated solution.

The patentees in these foreign patents, as well as in the abandoned United States process patent, contemplated and intended to patent only a process so far as it embodied the step of storage by the employment of certain solvents into which was introduced acetylene under pressure; and the step of confinement by the employment of a container with an outlet, "cock," "faucet" or "vent." So far these inventions patented in Great Britain, Germany and France are obviously identical with the invention sought to be patented in the

abandoned United States *process* patent. And their non-identity with the invention patented by the United States patent in suit is more obvious still in the light of the proceedings which led up to the rejection of the said process application and the allowance of its companion apparatus application.

These foreign patents may, or may not, in their specifications, contain a reference to certain pressure regulators which may be said to correspond to the reducing valve or means of controlling the pressure, etc., of the claims of the patent in suit. But, where they are mentioned in the claims or where they are mentioned in the specifications, it is apparent that the patentees did not intend that the pressure regulator should be considered as necessary element of the invention which was actually patented.

The U. S. Patent Office, in the proceedings for the process patent, and in the proceedings that developed into the patent in suit, held that a claim which described "a closed vessel *adapted* to contain a supersaturated solution of acetylene" did not by that language describe and claim as an apparatus "a closed vessel containing a supersaturated solution of acetylene."

The language in the first instance describes a closed vessel adapted to perform a certain function. The language in the second instance identifies the particular closed vessel in co-operation with another element of the unit—the supersaturated solution of acetylene.

It is evident that the "pressure regulator" is an accessory to the thing patented in the foreign patents.

This conclusion follows the more inevitably when the intent of the patentees as disclosed in the specifications of these patents is ascertained.

The invention patented abroad does not of itself employ or embody or necessitate a pressure regulator. It is accessory to that invention, to be supplied by the consumer together

with "consumers' apparatus" as and when needed. It bears the same relation to the unit patented as the tubing, burners or matches necessarily employed in completing the consumption of the lights. The invention in these patents ended with the step of storage and confinement for delivery.

The titles borne by the foreign patents have some bearing on ascertaining the intent of the parties as to the invention they were patenting.

The German patent is entitled:

> "Employment of liquids charged with acetylene for utilising acetylene" (T. R., p. 203).

The British patent is entitled:

> "An improved method of storing acetylene for lighting and other purposes" (T. R., p. 333).

The French patent:

> "French patent * * * for 'a system of storing acetylene.'" (T. R., p. 341).

The specifications refer to the reducing apparatus in each instance as an accessory to be employed for using the gas under certain conditions. It can be employed or the gas can be used directly without its intervention.

So in the *French* patent we find that the patentees describe their process invented as being limited to obtaining a solution under pressure for the storage of the acetylene, and then to the confinement of the solution so obtained in a "recipient" "provided with a faucet and the necessary fittings to enable it to be connected, either directly, or by means of an expander, with the apparatus of consumption at the house of the consumer" (T. R., p. 343). The apparatus for using the gas may be a separate means supplied by the consumer in which the patentee is only indirectly interested.

The claims of this French patent are for methods of dissolving and storing large quantities of acetylene in a small volume of liquid.

The "apparatus" of claim 2 of the French patent (T. R., p. 343), is not apparatus constituting a gas package, but apparatus "for the purpose of effecting the solution under pressure"—"to *cause* the solution under pressure" (italics ours).

This method the United States Patent Office did not grant a patent for.

The specification of the *German* patent (T. R., p. 203), likewise describes the invention specifically as a *process* of storage and confinement by the employment of certain solvents and the compression into these solvents of acetylene and the employment of a receptacle with a cock or vent for holding the resultant solution in confinement.

The drawing attached thereto and referred to therein *by way of illustration only* depicts a receptacle with a cock or vent for holding the solution in confinement. It is identical essentially with the apparatus of the drawing attached to the abandoned United States process application. This drawing was referred to by the Commissioner of Patents as a complete drawing, in which no pressure regulator was shown. He says that the cross reference in this application to the apparatus under a liberal interpretation was merely to (quoting) "An apparatus *adapted* to be used *in conjunction* with the method of storing acetylene for distribution herein described." What the Commissioner says about the abandoned United States process spplication is true also of this German process patent.

The description of the "flask" of the German patent effectually disposes of petitioner's contention that the invention disclosed in these specifications is identical with the invention covered by the *claims* of the United States apparatus patent.

The purpose and utility of this German invention is summed up in the second paragraph from the last of the specifications on page 207, T. R.:

> "If the flasks are to be used with portable lamps they are so formed that they fit into the base of such a lamp."

In the last paragraph the German patentees, just as they do in other foreign patents, provide for the use of their invention in connection with accessories such as a gasometer or a pressure reducing device. But this gasometer is not claimed as a part of the invention nor is the pressure-reducing device.

On the contrary, the patentees expressly disclaim any intention of including these means in the invention or in fact *any means*, for they say in conclusion (T. R., p. 207):

> "Indeed the apparatus described above and shown in Figs. 1 and 2 are only given by way of example for explaining the process, and the latter is independent of the described constructional forms."

The claim of this patent confirms this last statement. It is in terms of employment, or use, and not of means. It is a process claim—a process of storing and confining under pressure the gas acetylene by the employment of suitable liquids, dissolving the acetylene therein under pressure, and confining the same in suitable vessels. The product obtained from employing this process invented and patented may be utilized for supplying gas for consumption and in that case a pressure regulator is "preferably interposed."

What has been said of the German and French patents applies all the more forcefully to the *British* patent. There is no drawing attached to the specifications. The reducing valve referred to in the specifications is simply a means employed as an accessory for the utilization of the product resulting from the process invented and patented.

The sixth claim of the British patent contains no mention of a pressure regulating device. It is in terms of employment, or use, and not of means. At most, the claim expresses the employment, or use, of the product alone of storage and confinement in the solvent in a closed or vented receiver.

In summarizing these analyses of the respective foreign patents it is apparent that the foreign patents all fundamentally patent an invention which is defined by the process or method of storage of acetylene gas by compressing and dissolving the same in suitable liquids and of the confinement of the same in vented receivers, or containers.

None of these patents claim a complete illuminating apparatus as *the* invention patented, as a new article of manufacture, as does the first claim of the U. S. patent :

> "1. A closed vessel containing a supersaturated solution of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas, which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described."

That these methods and the apparatus of the patent in suit are separate and distinct inventions is supported by the decision of this Court in *Leeds & Catlin Co. vs. Victor Co. (supra)* and by the Circuit Court of Appeals, Eighth Circuit, in *Century Company vs. Westinghouse*, 191 Fed. Rep., 350.

It strikes us that in the former case the claims of the two patents there in question were more nearly identical than in the case at bar.

The patents both related to sound-reproducing machines, The Berliner Gramophone. The main question involved was the limitation of the term of the United States Berliner

patent by the expiration of the prior German Berliner patent. The claims of the United States patent in that case were (italics ours) (213 U. S., pp. 313, 314) :

> No. 5. " The *method* of reproducing sounds from a record of the same, which consists in vibrating a stylus and propelling the same along the record, by and in accordance with the said record, substantially as described.
>
> No. 35. " In a sound-reproducing *apparatus*, consisting of a traveling tablet having a sound record formed thereon, and a reproducing stylus shaped for engagement with said record, and free to be vibrated and propelled by the same, substantially as described."

Of this invention the " traveling tablet having a sound record thereon " was a means known and used in the prior art.

The German patent to Berliner covered an invention which " *relates to the instrument in the part of the apparatus performing the reproduction* " (p. 320). The petitioner claimed that " that instrument covered the most important part of the Berliner Gramophone," and that Berliner himself of this had publicly stated " that of the three principal features of the improvement of the patent in suit the *reproducer* formed one " (page 320).

The United States Berliner patent embodied in Claim 5 the " method of reproducing sounds " by the employment of a certain stylus in a certain manner, and in claim 35 embodied a combination of (1) a traveling tablet, and (2) a reproducing stylus.

The reproducing stylus described in these two claims, which was one of the principal features thereof and the most important part and the only new means, was the invention covered by the German Berliner patent.

Says the Court as to the identity of these inventions at page 320:

> "The inquiry yet remains, Is it identical with the invention of Claim 5, or Claim 35 of the patent in suit? It is not of Claim 5, for that is for a method, and a method is independent of the instruments employed to perform it. It is not of Claim 35, for that claim is for a combination, and one element is not the combination. Indeed, all of the elements is not. To be that—to be identical with the invention of the combination—they must be united by the same operative law. Of course an element is a part, an essential part, of the combination, and enters as an operative agent in the performance of its function. But this does not made it identical with the combination. It may be novel, patentable, of itself, subject to its own special monopoly, or it may be free for everybody's use; but whether free or not free, free when the combination was formed (invented), or became free, it is not identical with the combination. It follows, therefore, that the expiration of the German patent No. 53622 for the reproducer did not affect the duration of the patent in suit so far as Claims 5 and 35 are concerned, even though such reproducer is made the subject of one of the claims of the patent in suit."

And on page 318 says:

> "A process and an apparatus by which it is performed are distinct things. They may be found in one patent; they may be made the subject of different patents. So may other dependent and related inventions. If patented separately, a foreign patent for either would not affect the other. * * *
>
> "A combination is a union of elements which may be partly old and partly new, or wholly old or wholly new; but whether new or old, the combination is a means—an invention—distinct from them. They, if new, may be inventions and the proper subjects of patents, or they may be covered by claims in the same patent with the combination.

> " But whether put in the same patent with the combination or made the subjects of separate patents, they are not identical with the combination. To become that, they must be united under the same co-operative law. Certainly one element is not the combination, nor, in any proper sense, can it be regarded as a substantive part of the invention represented by the combination, and it can make no difference whether the element was always free, or became free by the expiration of a prior patent, foreign or domestic."

Siemens vs. Sellers, 122 U. S., 276, in connection with *Western Electric Co. vs. Citizens, Etc.*, 106 Fed. Rep., 215 ; *Sawyer Spindle Co. vs. Carpenter*, 133 Fed. Rep., 238 ; *Thomson vs. McLean*, 153 Fed. Rep., 883, are modified, distinguished and limited so that the case at bar is taken from without their ruling. We refer to page 316 for this.

In those and other cases the foreign and domestic patents involved, either, each covered processes for the manufacture of the *same* article and were differentiated from each other by slight changes in detail—such as *Commercial Mfg. Co. vs. Fairbanks*, 135 U. S., 176; or each covered apparatus which as units were the same, and which were composed of the same elements, or equivalent elements; the thing patented in both patents was the apparatus.

The domestic and foreign patents concerned in *Commercial Mfg. Co. vs. Fairbanks*, 135 U. S., 176 covered elaborate processes which were described in minute detail. The departure of the foreign patents from the descriptions and directions contained in the domestic patents were variations in degree.

Says the Court, on page 190 :

> " So that taking the Bavarian patent as a whole, there would seem to be such an identity in the processes described as to make them essentially the same. * * * Yet we think that there can be no doubt that he has substantially described the same process in both patents."

And again on page 191 (quoting from the Circuit Court):

> " The French and the English patents give substantially the same description for the process as is contained in the Austrian and Bavarian patents. * * * As already said, it seems clear from Mégé's own statements and those of his own solicitors, that the purpose was to cover by the American patent what had been covered by his French patent in 1869. * * * The points of difference * * * are purely wholly and differences in degree" (page 192).

In all these patents the necessity of crushing was stated while the degree of crushing was mentioned in but one patent and was omitted but *understood* in others (page 192).

Where the claims of one patent include additional elements or omit some of the elements of the other patent, a new combination is established.

Westinghouse Co. vs. Stanley Co., supra.

Therefore, as the British, German and French Claude and Hess patents cover a process, or method, they do not limit the term of the United States patent which covers an apparatus, of which the product of said process or method is an element.

In commenting on the *British* Claude and Hess patent, the Circuit Court of Appeals for the Sixth Circuit in the case of *Acme Acetylene Co. vs. Commercial Acetylene Co. (supra)*, after reading into the 6th claim of the said British patent a phrase from the specification, which phrase added to the receiver mentioned in said 6th claim the following clause:

> "a cock and the necessary adjuncts for connection, directly or through an expansion chamber, with the appliances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected:

said:

> " If this were considered in connection with Claim 6 the receiver would still be lacking in certainty of de-

scription and its designed function would remain indefinite except as a receptacle from which acetylene under pressure would be 'evolved when required for use.' It is most difficult to perceive how this would afford the slightest suggestion either of the 'closed vessel' comprised in the patent in suit or the object seemingly accomplished by it. See claims 1, 2 and 5 of the patent in suit (C. C.), 166 Fed., 909. Evolving gas under pressure from the receiver according to Claim 6 is not (as stated in the Claims alluded to of the patent in suit) controlling the outlet, as by a reducing valve, 'whereby the gas may escape therefrom at substantially uniform pressure.' The difference between the receiver in the one instance and the closed vessel in the other, would seem to be that the former was intended to contain, and through indifferent means of escape to supply, the only thing invented; while the latter was intended to be a distinctive and purposeful element of the invention."

Acme Acetylene Co. vs. Commercial Acetylene Co., 192 F., 321, 327.

This quotation points out the essential difference between the United States patent and all the foreign patents. The thing the inventors were concerned with in the foreign patents was the general process.

The receptacle was a matter of indifference and had no function or purpose as to the foreign patents, or their claims, beyond that of confining or containing the gas in solution. There had to be a receptacle or means disclosed as in the case of many process patents, but the thing uppermost in the inventors' mind was the process itself and the product resulting from the performance of that process. On the contrary, in the United States patent uppermost in the inventors' minds was a complete apparatus, or gas package, one of whose functions was the delivery of the gas to the burners at a substantially uniform pressure. There were two different conceptions and two different things patented. The fact that the same discovery was at the base of both inventions, and things pat-

ented, does not render them identical. Nor does the fact that the specifications of the one patent point out or indicate steps or means for procuring utility which are not claimed, render the invention therein patented identical with an invention patented in another patent which specefically claims that element or means in combination.

It was this very distinction that the Patent Office made in rejecting the claims of the companion process application. Those claims, which certainly recited no elements—even when amended—to provide for maintaining of uniform pressure, were rejected.

The Board of Examiners in Chief proposed the language which is embodied in Claim 1 of the patent in suit (T. R., p. 407, 413).

As the absence of means of control so affected the patentability of the claims of the abandoned application, it follows that its absence from the claims of the foreign patents will correspondingly affect the identity of those patents with the patent in issue which specifically claims that means of control.

The doctrine of *Siemen vs. Sellers* (123 U. S., 276), was commented on and differentiated by this Court in the *Leeds & Catlin* case, and the Court, in that latter case holds that a patent for a process, and a patent for an apparatus to perform that process, are two distinct things within the meaning of the statute, and it also holds that, even where *both* the foreign and the United States patent cover an apparatus, there is no identity of invention patented within the meaning of the statute when the apparatus covered by the foreign patent is merely one element of the apparatus covered by the United States patent.

Take either one of these principles of law, and apply it to the patent in suit; under the one, the foreign patents patent a process, while the United States patent patents an apparatus of which the product of this process is only an element, and

therefore the inventions patented are not identical within the ruling of the *Leeds & Catlin* case ; under the other, the United States patent covers an apparatus of which the apparatus disclosed in the foreign patent is merely an element, and is not the complete apparatus. So in either case, under the ruling of the *Leeds & Catlin* case, the United States patent and the foreign patents are not identical. On this point the Circuit Court of Appeals for the Sixth Circuit, says :

> " The application of the limiting act of Congress, as made in the Leeds & Catlin case, is helpful in passing upon the contention here made that the effect of this act was to limit the life of the patent in suit to that of the British patent. Analogy will be found respecting the difference between the two patents now in dispute and the difference there held to exist between Claims 5 and 35 of the United States patent granted to Berliner and involved in similar contention respecting the effect upon its term through the expiration of certain foreign patents. The substance of Claims 5 and 35 may be found at pages 313 and 314 of 213 U. S. * * * of the Leeds and Catlin case. When speaking of a German patent granted to Berliner and a contention that it had expired, and the patent in suit has expired with it, and also of a lecture delivered by Berliner, Mr. Justice McKenna said (213 U. S., 320) : ' But granting that he did say so, and that it is so, the inquiry yet remains, is it identical with the invention of Claim 5 or Claim 35 of the patent in suit ? It is not of Claim 5, for that is a method, and a method is independent of the instruments employed to perform it. It is not of Claim 35, for that claim is for a combination, and one element is not the combination. Indeed, all of the elements are not. To be that—to be identical with the invention of the combination—they must be united by the same operative law. Of course, an element is a part, an essential part, of the combination and enters as an operative agent in the performance of its functions. But this does not make it identical with

the combination. It may be novel, patentable of itself, subject to its own special monopoly, or it may be free for everybody's use, but whether free or not free, free when the combination was formed (invented) or became free, it is not identical with the combination. It follows, therefore, that the expiration of the German patent No. 53,622 for the reproducer did not affect the duration of the patent in suit so far as Claims 5 and 35 are concerned, even though such reproducer is made the subject of one of the claims of the patent in suit.'

"It might, therefore be conceded that the product described in the British method patent is the same as the product contained in the closed vessel described in the patent in suit; and still the difference between the two patents now under consideration, would, under the decision in the Leeds and Catlin case prevent the limitation in term of the British patent from affecting the term of the patent in suit.

"These views require us with deference to decline to follow the decision in Commercial Acetylene Co. v. Searchlight Gas Co., *supra*. As Judge DENNISON forcibly said of the patent in suit (C. C.), (188 Fed., at page 92):

> 'It was granted in 1900 for 17 years. The patent office did not require it to be limited on its face, although the British patent was of record in the United States Patent Office. Now, to shorten the 17-year term into a 10-year term, is a step that I think should not be taken unless the statute is clearly applicable.'"

Acme Acetylene Co. vs. Commercial Acetylene Co., 192 F., 321, 328.

As held in a long line of decisions, it makes no difference what a foreign patent *discloses*, it is what it *patents* that affects the United States patent. Whether the two patents cover the same invention must be determined by the tenor and scope of their claims, not by the description in the specifications.

McMillan vs. Reese (1st Fed. Rep., page 722).
Railroad Co. vs. Mellon (104 U. S., 112).

White vs. Dunbar (119 U. S., 47).
Westinghouse vs. Stanley Co. (138 Fed. Rep., 823).
Burns vs. Meyer (100 U. S., 671).
Keystone Bridge Co. vs. Phœnix Iron Co. (95 U. S., 274).
Toohey vs. Harding (1 Fed. Rep., 174).
Yale Lock Co. vs. Greenleaf (117 U. S., 554).

In *Holmes vs. Metropolitan Co.*, 22 Fed. Rep., 341, the Court says :

> " It is only a patent for an invention that has been previously actually patented in a foreign country that is limited by the foreign patent. The description of the invention in a foreign patent might affect the validity of the domestic one, and might not, but would not limit it."

In *Westinghouse vs. Stanley Co. (supra)*, an instructive case upon this point, the Court quotes *Robinson on Patents*, Section 623, as follows :

> " In order that the term of the foreign patent may thus limit that of the domestic patent, it is essential that the inventions covered by the two patents should be identical,"

and the Court says (italics ours) :

> " It will be noticed that the author uses the word ' covered ' and not ' shown ' or ' disclosed.' He makes his position clear by his note to this section, wherein he cites a decision that the foreign patent is not effective unless the *claim*, as well as the patent itself, describes the same invention."

The case alluded to by the Court in this quotation as being cited by Mr. Robinson, is *Holmes vs. Metropolitan Co. (supra)*.

As pointed out by the Court in the *Acme Acetylene Appliance Company* case, the British patent, as a sample of the

foreign patents, does not even disclose the apparatus patented by the United States patent. The apparatus disclosed in the foreign patent is "a receiver from which acetylene under pressure would be evolved when required for use," and in that apparatus the gas may blow out for use through indifferent means. The American patent requires a means whereby the escape may be controlled so that there is a substantially uniform pressure.

As said before, all the foreign patents, in unmistakable terms, stamp themselves as process patents. *In the German patent to Claude and Hess* the specifications close with the statement (italics ours):

> "In case it is necessary to withdraw the gas at constant pressure from the flask, as already mentioned, a pressure regulator is interpolated, namely, the acetylene may be simply conducted into a gasometer, or one of the many known pressure reducers is arranged directly over the gas outlet. *Indeed, the apparatus described above, and shown in Figs. 1 and 2, are only given by way of example for explaining the process, and the latter is independent of the described constructional forms.*"
>
> (T. R., p. 207.)

And the claim of the German patent reads (T. R., p. 207):

> "The employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating and the like, characterized by the acetylene being absorbed under pressure by a suitable liquid, and the liquid, saturated with acetylene, being preserved or contained in suitable vessels, from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed."

There is thus in this German patent no room for contention that the apparatus as embodied in the United States pat-

ent is *claimed*. The inventor expressly disclaims any such apparatus.

All these foreign patents show that the inventors in each case were merely patenting their process and describing an apparatus for carrying it into effect. It was only when it came to the United States that they patented the complete gas package embodied in the United States patent.

In like manner, the inventor of gun powder, having discovered the fact that its components would produce that desirable explosive, might have patented the process, or method of making gun powder by mixing the ingredients. He might then conceive the idea of a cartridge complete in itself of which the elements would be: First, the product of his process, namely, the gunpowder; second, a containing shell; third, a bullet; and fourth, means, fulminate cap, for causing the explosion and securing the projection of the bullet. The new thing in the cartridge would be the product of his process; all the other elements of the patented cartridge might be old, but when united with the gunpowder it becomes actually a new thing and patentably a different thing from the process or its product.

A patent on the process of manufacturing this gunpowder would not be identical with a patent on the complete cartridge, and yet the basic discovery that made both of these things possible would be identically the same. This may be taken as an illustration of what the inventors, Claude & Hess, did in the present case. They discovered that acetylene and acetone in solution under pressure had certain properties which made it useful and valuable as a process for storing acetylene. Then they conceived the idea of a complete gas package which would embody the product of this process, just as the cartridge embodies the gun powder as one of its elements. This gas package would be very desirable for use on moving vehicles, for instance, where all that was necessary would be to connect the package itself up with the burners and the

lights would be ready to be used. Just such a use as this may have been contemplated by the patentees when they said in lines 58 to 83, Specifications :

> " It may in some cases be desirable to provide each apparatus with a burner, so that said apparatus in itself constitutes a lamp, or to provide lamp burners, in conjunction with which the apparatus may be used as a detachable fount " (opp., p. 427 of T. R.).

The ordinary container with an ordinary vent cock would not be suitable for such use, because the pressure could not be properly regulated. They therefore took out a patent on this complete gas package of which one of the elements was the product of this process and another was a means for controlling the gas at substantially uniform pressure.

The foreign patents are not identical with the American patents because in the first place, they are patents for a process, while the American patent is a patent for an apparatus, and in the second place, the apparatus disclosed in the foreign patents, but not patented therein, is merely an element in the combination embodied in the American patent.

It will be remembered that, under our practice, then prevailing, Claude & Hess could apply for and might obtain two patents embodying their discovery ; one for the invention embodying that discovery in a process ; another for the invention embodying that discovery in a complete apparatus. *Before* there was any abandonment of the application for a patent for a process, they were allowed by our Patent Office a patent for the invention embodying the discovery in a complete apparatus. They elected to take their protection under that patent. Not a single patent in any foreign country in this record is a patent for such a complete apparatus. Pertinent to the well recognized distinction between the patent for a process and the patent for an apparatus, we may refer to the case of the

Century Electric Co. vs. Westinghouse Co., 191 F., 350, 359, from which we quote as follows : (italics ours.)

> "The second contention of counsel for the defendant is that patents No. 511,915 for the process and No. 555,190 for the apparatus are for the same invention and therefore the latter is void. The rules and principles which have already been stated and applied in the consideration of the validity of these patents in the face of No. 445,207 condition the decision of the question which this contention presents. The claims for these two patents were first made in a single application filed May 15, 1888. At that time there was a clause in rule 41 of the Rules and Practice of the Commissioner of Patents that 'claims for a machine and the process, in performance of which the machine is used, must be presented in separate applications,' a clause which was held to be unauthorized and void in 1904 in *Steinmetz v. Allen*, 192 U. S., 543, 563, 24 Sup. Ct., 416, 48 L. Ed., 555. Under that clause the Commissioner required Tesla to divide his application, to present his claims for his process and his claims for his apparatus in separate applications. He complied with this requirement and these patents issued on the separate applications. There can be no doubt, therefore, that at the time the contracts, evidenced by those patents, were made the parties to them believed that they were for distinct and separate inventions and intended that patents for them as such should issue. But counsel argue that notwithstanding this fact the patented process cannot be used without the patented apparatus nor the patented apparatus without the patented process, and from this fact they deduce the conclusion that they are for the same invention. The deduction does not seem to be warranted. Section 4886, Rev. Stat. (U. S. Comp. St., 1901, P. 3382), declares that any person who 'has invented or discovered any new or useful art, machine, manufacture or composition of matter' may have a patent therefor. If one discovers an art or process, and invents a machine to practice it, does he deprive himself of his right to a patent for his

process by securing a patent for his machine? The statute answers this question in the negative. It provides that any person who has invented a new and useful machine may obtain a patent for it, and it does not except one who has also patented a process in the practice of which his machine will be useful. As Congress made no such exception, the Courts may not do so. *Armour Packing Co. vs. United States*, 82 C. C. A., 135, 152, 155, 153 Fed.; 1, 18, 21, 14 L. R. A. (N. S.), 400.

"Moreover, it is as probable that an apparatus will be invented which is not the mechanical equivalent of that patented, by means of which the patented process may be practiced as it was before the event that the patented process would be discovered and the patented machine. And the patentee is entitled to the protection of his process against its use by such a subsequently invented machine, and also to protection of his apparatus against its infringement, by its mechanical equivalents. *Hence the patents for the process and for the machine by which it may be practiced are not for the same invention and neither was rendered void by the other.*"

There seems to be not one of the claims of any of the foreign patents but that would be infringed by a device with less elements in combination than is required for infringement of the patent in suit.

Wherefor, we submit, the term of the patent in suit should not be held to be limited by the terms of any of the foreign patents referred to.

SECOND.

The Apparatus of Petitioner infringes Claims 1, 2 and 5 of the patent in suit.

Petitioners in the Court below and here contend that there is no infringement:

First, because the gas package manufactured and sold by them did not employ as an element of the structure a diaphragm valve but in its place and stead employed a needle valve.

Second, that the gas package manufactured and sold by defendants did not employ as an element of its structure the specific solvent acetone to which the invention was limited by the decision of Judge QUARLES, but in its place and stead did employ a different solvent called "terpeline."

Third, that the gas package manufactured and sold by defendants did not employ a valve located above the level of the solvent, but on the other hand, the valve employed as an element of the structure was so located as to be below the level of the solvent.

FIRST. Claim 1 calls generally for any "means for controlling the outlet whereby the gas may escape therethrough at substantially uniform pressure." The specifications (lines 64 to 66, T. R., opp. p. 427), say: "It is not intended to limit the invention to the specific construction herein shown since modifications may obviously be made."

The proceedings before the Patent Office appearing in the file wrapper, including the final determination of the Examiners in Chief, who suggested the allowance of Claim 1 in the lnguaage in which it now appears (T. R., pp. 406, 407), disclose that as an essential element of the gas package some "means for controlling the outlet thereof, whereby the gas may escape therethrough at substantially uniform pressure" was necessary; but it is

plain that no particular form of valve construction was required, providing the gas escaped from the outlet at substantially uniform pressure. This was the desideratum. The package itself must be a unit which would have its own means of controlling the escape of the gas, so that the pressure thereof could be reduced from an enormous pressure at which it was held in confinement to a relatively finite pressure at the burners, so that by the co-action of all the elements of the gas package the gas would be delivered at substantially uniform pressure. With this means a steady and non-flickering light could be obtained by the user without continuous manual attention or regulation of the valve.

Defendants' gas package, the Fireball gas tank, and complainants' gas package, the Prest-o-lite gas tank, accomplish just this result. The affidavit of Gallagher (T. R., p. 442) demonstrates that for eight hours the gaseous contents of the Fireball gas tank is delivered through its valve without any "very serious decrease in the illuminating power of the flame" (p. 450) and without any manual regulation. When the duration of this run is considered in connection with the average use of headlights on automobiles, where a continuous run of over four hours is rare, then the statement that these needle valves do not constitute a means whereby the gas is allowed to escape therethrough at substantially uniform pressure becomes a technical quibble.

The best evidence however of the fact that these valves do constitute "this means" is the experience of the thousands of users of these gas packages. If the gaseous contents were not delivered from the packages at substantially uniform pressure they would be unsaleable. As a matter of fact the extent of use of this form of lighting automobiles is a matter of common knowledge.

The fact that this valve may not perform its automatic regulation through such a complete range both of pressure and of time as a diaphragm reducing valve, is not to the point.

A defendant does not escape infringement by the mere lessening or debasing of the perfection of performance of an element in a patented combination.

> "To constitute an infringement, * * * it is not necessary that the defendant should employ the plaintiff's invention to as good advantage as he employed it, or that the result should be the same in degree."
> *Sewall vs. Jones*, 91 U. S., 171, 183.

> "One may not escape infringement by adding to or substracting from a patented device by changing its form or by making it more or less efficient * * *."
> *Lourie Implement Co. vs. Lenhart*, 130 F. R., 122, 129 (C. C. A., 8th Circuit).

SECOND. The second contention under this Point resolves itself into a question of fact. Petitioners contend that they do not use the particular solvent acetone which Judge QUARLES in the Avery case limited his decision, but that in its place they employ as an element of the structure a solvent called "terpeline". Examinations of three of defendants' gas packages conducted by three different chemists, one at St. Louis, one at Indianapolis and one at Boston, show, however, that in at least three instances defendants did employ acetone as their solvent.

To explain this unanimity of these three experts defendants produced an anonymous letter directed to Joe Soloman in which it is alleged that some one has been seen tampering with the Fireball gas tanks (T. R., p. 216).

The affidavits of complainants' witnesses conclusively establish that the solvent employed as an element in defendants' gas package consists of about 95 per cent. acetone and about 5 per cent. turpentine of which the turpentine has very little value as a solvent of acetone and is probably used to disguise the odor of acetone. It can also be remarked here that according to the testimony of defendants' experts their so-called

"terpeline" has a dissolving value upon acetylene of 25. This is also the solvent value of acetone as disclosed by the researches of Claude and Hess.

THIRD. The third contention under this Point is not well founded.

The inventors of the gas package, Messrs. Claude and Hess, at the time of their invention probably had uppermost in mind its use while stationary, for instance, in lighting houses, etc. The extensive use to which this apparatus has lately been devoted in connection with automobiles is a more recent development. It is obvious that the location of the valve below the level of the solvent will cause the solvent to blow out with the solution in the manner of the liquid in a seltzer bottle. Respondents, in adopting this gas package for use in connection with automobiles, found that the slopping around of the solution in the interior of the tank through the motion of the car caused the solvent of the package to issue from the valve with the gas.

To prevent this the interior of the container was completely filled with porous asbestos discs which absorb the solvent and distribute it through the interior of the tank and hold it by the power of capillary attraction. Petitioner's tank is equipped in this way also with asbestos. This porous asbestos enables the gas package thus to be laid down on its side or inverted without causing any escape of the solvent with the gas. This is true of the petitioner's tank as of respondents' tank and would be just as true if the valve were located at the bottom of the tank as if it were located at the top.

The weakness of this contention appears when it is considered that petitioners' argument presupposes that these tanks always lay horizontally parallel with the ground, whereas as a matter of fact they often stand upright or in the case of an automobile going up hill are often located so that the valve is entirely above the body of the solvent. When going down

hill the solvent might run out of the valve whatever might be the structure of Petitioners' valve, if located as shown, if it were not for the retaining power of the asbestos filling.

One of the claims (claim 1) in the patent in suit calls for no such location of the valve as is contended by appellants' counsel and when such location is required by the other claims a mechanical equivalent of such location is found in the use of the asbestos by both the complainants and defendants.

THIRD.

The claims in issue are not invalid for lack of patentable novelty.

(a) The invention patented.

The "gas package" invented and patented by Messrs. Claude & Hess is a complete illuminating apparatus. As a learned chemist once said of it :

> "The invention of the Claude and Hess patent is not a mere passive collocation of tank and valve, but an active, co-operative combination, to the resultant action of which all the elements unite and of which elements the supersaturated solution of acetylene in acetone is most important and active."

Judge QUARLES, in *Commercial Acetylene Co. vs. Autolux Mfg. Co.*, 181 Fed. Rep., 387, at page 390, held substantially the same opinion.

The proceedings in the Patent Office, which took place prior to the papers just quoted, and which led up to the position finally taken by the Board, Judge QUARLES reviews as follows :

> "It would not be profitable to review in detail the long and bitter contest in the Patent Office before these

three claims were allowed. The primary difficulty seems to have been to what extent the solvent, supersaturated with gas, might be considered an element of the combination in the apparatus patent. The Office was disposed to consider the closed vessel and the reducing valve as the only legitimate elements of the apparatus disclosure. * * *

"But, after repeated arguments and references, especially to the patent upon the thermometer with its bulb and stem, and the column of mercury therein, it seems to have been decided that the liquid and gaseous contents of this package might be legitimately suggested as elements of the combination constituting the package; * * *."

Commercial Acetylene Co. vs. Avery, 166 F., 909, 910.

The entire Patent Office proceedings leading up to the grant of the patent in suit are not contained in Petitioner's Exhibit File Wrapper of Patent in Suit as printed in the Transcript of Record. It does appear at T. R., p. 405, that an appeal was taken to the Examiners-In-Chief who filed a decision June 19, 1899. Without quoting from that decision, because it is not in this Record, we may however adopt as our language herein language from that decision to identify the invention of the patent in suit having in mind the special solvent acetone:

We are, however, impressed with the fact that applicants have devised a means for safely transporting acetylene which is new and a manifest improvement in the art. None of the references cited show a "package" for dispensing acetylene gas, a closed vessel containing a supersaturated solution of acetylene produced by forcing actylene into the solvent under pressure, said vessel having an outlet for the acetylene gas, *which escapes from the solvent when the pressure is relieved or reduced, and means for controlling said outlet, whereby the gas escapes therethrough at substantially uniform pressure, substantially as described.*

On appeal, in the method application, the Examiner, in his statement to the Board, admitted that applicants were "the discoverers of the large absorptive powers of acetone for acetylene gas" (T. R., p. 280), but stated that "the *mere storing* of acetylene is without utility" (*Ib.*), and suggested a method claim as follows (*Ib.*):

> "First storing the acetylene by filling a vessel capable of withstanding a considerable pressure with acetone, and impregnating such acetone with acetylene under pressure of several atmospheres, and then in using the acetylene in relieving the pressure, permitting the gas to be spontaneously evolved from the acetone and finally conducting the gas to its place of use through suitable pressure regulating devices."

In other words, the Examiner insisted on some provision being made to give utility to the discovery of the ability of the acetone "to give out the gas for consumption," and that it was not sufficient to provide simply for first, the absorption of the gas, and, second, the confinement of the gas. The third step, the delivery of the gas in a useful way, must be supplied.

We respectfully submit that the proceedings in the Patent Office fully support the statement that the essence of the invention patented is the property of acetone, for, first, absorbing enormous quantities of acetylene in proportion to the pressure exerted on the solution thereby formed; second, holding the same in confinement in safety for transportation; third, giving the same off uniformly in conjunction with a suitable regulator notwithstanding changes in temperature, etc.

And with the same confidence we assert that the *entire* proceedings in the Patent Office fully support the proposition that the "means for controlling the escape of the gas" is not the essence of the invention; nor is it *per se* the discovery of the applicants; nor is it an independent element of the

combination invented and patented which by itself and of itself produces the result contemplated by the inventors.

> "What is the pith of this invention? It is to furnish means to store compactly and transport safely acetylene gas for illuminating purposes. The novelty consists in employing a solvent which has the wonderful properties and advantages that have been rehearsed. In such a package there must necessarily be an inlet and outlet. But the inventive thought was not concerned with the specific structure of the outlet valve. It was obvious that by some means the enormous pressure within the tank should be reduced so as to sustain a steady flame at the burner."
>
> *Commercial Acetylene Co vs. Avery*, 166 Fed. Rep., 907, at p. 916.

The conclusion which both the Patent Office and Judge QUARLES reached was that the inventors, Claude and Hess, had for the first time in the history of the art devised a practical means of storing and transporting acetylene, which they proceeded to endow with utility by the employment therewith of any "means of controlling and regulating the delivery of the gas from its confinement." This resulted in the gas package in suit. The complete gas package was made possible by the basic discovery by the inventors of the peculiar and undreamed of affinity of acetylene for acetone with the surprising resultant safety of the combination. The employment of the resultant product of the combination under pressure of these two substances as an element in the apparatus, or package, of the patent, made such a package practical for the first time.

The *discovery* was the affinity of acetone for acetylene and the characteristics of the solution. The *invention* patented was the gas package as claimed. This patented invention was new, for it could not be made before the discovery made it possible. The employment of means for distribution or means

of control made it useful, as the demand for it and its wide use demonstrates.

It makes no difference in the patentability of the invention that some of the elements—as the tank, the valve, or even the combination of the tank and the valve, are old—or the broad fact of general solubility of the gas in some solvent was known —the complete package was new and therefore patentable.

Leeds & Catlin Co. vs. Victor Co. (213 U. S., 301–320).

It would make no difference if all the elements of the combination were old.

Leeds and Catlin Co. vs. Victor Co. (supra).

This invention was not only new, but it is the pioneer invention in this art. The thing patented, in spite of demand and need, in spite of insistent search and constant experiment, had never before been produced. The single basic discovery made it possible. It is, therefore, in a peculiar degree a meritorious patent, and is entitled to a liberal construction and a wide range of equivalents.

Commercial Acetylene Co. vs. Avery (supra).
The Paper Bag Patent Case (210 U. S., 405).

The patent in suit, therefore, is not one for a method of storing acetylene, nor is it one for a closed vessel with a reducing valve. It is a combination, an apparatus patent, of which one of the elements is the product of a process, another is a closed vessel, another is a means for controlling the gas so that it will escape at substantially uniform pressure. In other words, it is an apparatus, a gas package, designed for a definite purpose—to safely transport acetylene, ready to be attached to the burners and by its own action deliver the gas to the burners in usable form. To accomplish this purpose each element of the combination contributes its part in actual cooperation.

The inventors thus provide a relatively safe and very convenient and efficient apparatus for storing and distributing acetylene gas, whereas, prior to the date of their invention and owing to the fact that acetylene is an endothermic compound and as such instable and often explosive when compressed or liquified, the attempts which had been made to increase the storage capacity of reservoirs or packages for acetylene by compressing the gas therein had resulted in numerous disastrous and often fatal explosions.

(*b*) *The Prior Art.*

German Patent to Webb (T. R., p. 316) : This patent does not disclose the invention of the claims in suit because it does not have the supersaturated solution of acetylene in acetone and does not have any solvent whatsoever for the gas.

Journal of Franklin Institute (T. R., pp. 223, 237) : This does not disclose the invention of the claims in suit because it discloses a tank containing liquified acetylene which is not acetylene dissolved in acetone. The acetylene, a gas, is compressed to such an extent that it is liquified. This belongs to the dangerous prior art, superseded by the adoption of the invention of Claude & Hess.

British Patent to Gearing (T. R., p. 321) : This patent discloses a tank containing water, in which is placed a stick of prepared carbine. The water does not fill the tank. The action of the carbide and water is to generate acetylene, which then may be used for illuminating purposes through a proper reducing valve. This patent does not disclose the invention of the claims in suit. It does not contain a supersaturated solution of acetylene in acetone.

German Patent to Loesner (T. R., p. 383) : This patent is for a process, not for an apparatus. It is for "a process for separating chlorine from gaseous mixtures" (p. 384). The process includes passing the gaseous mixture containing chlorine through liquid *organic* bodies. Having put the

chlorine into the liquid in this manner, the solvent is heated or reduced in pressure and the chlorine is separated. This patent does not disclose the invention of the claims in suit.

Henry's Law: This law, so far as it goes, is general and does not preclude the exercise of patentable invention in discovering a concrete application of that law and reducing it to practical commercial form. It substantially states the principle that gases are soluble in liquids, the quantity of gas dissolved depending upon the pressure. Variations from the law required experimentation to determine its applicability to a given liquid and gas, as Judge QUARLES refers to this law in *Commercial Acetylene Co. vs. Avery Portable Light Co.*, 166 F., 910, "Henry's Law with its many variations". Judge QUARLES also, in referring to this law, says in that same case (p. 911):

> "The principle in physics that all gases were soluble in liquids was well understood. What is known as 'Henry's Law' had been familiar for a hundred years, that, broadly speaking, the quantity of gas that a liquid would absorb depended upon the pressure under which it was introduced. These general principles had been already embodied in commercial packages containing water charged with ammonia gas and beverages charged with carbonic acid gas, etc. But it seems evident these primary laws and their former crude embodiment did not and could not lead to the discoveries brought to light by Claude and Hess. It was by patient experiment that they learned that acetone under a pressure of twelve atmospheres would absorb acetylene to the extent of three hundred times its own bulk; that when combined in solution, these inflammable and explosive substances would tolerate the introduction of a platinum wire heated to a white heat without explosion; that such mixture would not freeze and was not corrosive; that the two substances were miscible at all temperatures; and that if a small quantity of the solvent escaped with the gas it would not retard combustion."

The statement referred to in the Claude & Hess addition to French patent No. 257,679, June 11, 1897 (T. R., p. 353), refers to Claude & Hess' statement that it was known from researches made by Berthelot and Vielle that the solution of acetylene in acetone under a pressure of not much more than ten atmospheres *would not "explode"*. This is not a statement of prior invention in Berthelot and Vielle. This addition patent of Claude & Hess was to provide means for preventing explosion of free acetylene, not dissolved. It bears date June 11, 1897, whereas the application for the patent in suit was filed in the U. S. Patent Office on March 1st, 1897. The undoubted fact is that after the disclosure in France of the main discovery of Claude & Hess as to the affinity of acetone for acetylene, scientists studied its properties, among them the two named, who determined the non-explosive character of the solution, although the acetylene undissolved in the acetone was well known to be highly explosive. The fact that Berthelot may have previously discovered the solubility of acetylene in alcohol as a general proposition is not pertinent.

Although many other alleged prior art patents, etc., are in the record, the foregoing are all that we find referred to in the brief for Petitioners.

FOURTH.

Miscellaneous.

(*a*) *The patent is not void "because the essence of the invention was added by amendment."*

The record shows these facts: On February 11, 1897, Claude & Hess made oath in Paris to their application for the patent in suit (T. R., p. 393). On the same date and at the

same place, Claude & Hess made oath to their application for U. S. patent for the method of storing acetylene gas for distribution (T. R., p. 263), which application was allowed to lapse after they had secured allowance of the application for the apparatus patent. The original application for the apparatus patent in suit did not deal as fully with the solution of acetylene in the solvent as did the method application, where some of the advantages of the use of acetone as the solvent were set out (T. R., p. 261). In the original apparatus application this language was used (T. R., p. 390): "Contained within the reservoir is a fluid *b* capable of dissolving acetylene gas * * * ." To identify the solvent and extent of solution of the gas in it, etc., the following clause followed the last above-mentioned quotation in the method application:

> "in accordance with the method set forth in our other application above referred to"

(this other application being the method application referred to at T. R., p. 389, in the following language—"the method described by us in another application filed herewith"). Both these applications were filed on the same date, namely, March 1, 1897 (T. R., p. 393; T. R., p. 264). The method application as originally filed contained a claim for the use of acetone as the solvent (claim 2, T. R., p. 283). By the first amendment to the apparatus application, which amendment was filed July 9, 1897 (T. R., pp. 395, 396), the words—

> "such as alcohol or acetone"

were inserted into the apparatus application. By requirement of the Patent Office, dated August 23, 1897, the clause hereinabove quoted from the apparatus application, reading—

> "in accordance with the method set forth in our other application above referred to"

was cancelled because the Patent Office required it and stated—

> " Pending applications are not open to the public for inspection and it can not be assumed that applicants' co-pending case will mature into a patent " (T. R., p. 397).

It therefore appears that in the strictly technical sense only was the—

> " essence of the invention added by amendment."

As a matter of fact, under the circumstances above outlined, the " essence of the invention " was included in applicants' oath at the time of the filing of the original application for the apparatus patent in suit. No new invention was really added after filing. The facts in this case, we submit, take it entirely outside of the decision of this Court in *Stewart vs. American Lava Co.*, 215 U. S. 161.

(*b*) *The fact that the porous filler added to apparatus of the patent in suit is an improvement thereon does not detract from the value of the basic invention of Claude and Hess.*

This defense was raised in the case of *Commercial Acetylene Co. vs. Avery Portable L. Co.*, 166 F., p. 907. In that case Judge QUARLES has the following to say as to this point (p. 912):

> " It is further urged by way of defense that the package of Claude & Hess, which employed no porous packing, was palpably unsafe and impracticable, because an open space was left above the liquid solvent. This attack seems to be predicated upon general principles, as no proof was directed to the subject by defendat, beyond a cross-examination of one of complainant's experts.
>
> " The evidence offered by complainant tends to show that the Claude & Hess package was in point of safety

a vast improvement over everything theretofore disclosed in the prior art. Mr. Little, one of complainant's experts, when asked whether he considered the Claude & Aess package safe without the porous filling disclosed by Fouche, answered that:

> " ' While relatively not as desirable if unfilled with porous material, still, relative to anything in the prior art I regard the Claude & Hess package as incomparably safer than anything previous.'
>
> " Prof. Hallock, another of complainant's experts, having his attention drawn to the subject, answered in substance that such such package would be safe for transportation and use if handled with care and intelligence.
>
> " Claude and Hess in their literary disclosure had advocated the use of asbestos to render the liquid in the tank immobile. Shortly thereafter, Fouche obtained a patent for filling the package with asbestos, into which the acetone was admitted, claiming not only that the liquid contents was rendered immobile, but that the danger of explosion was limited thereby; that this feature was a decided improvement upon the Claude & Hess package was universally recognized. So that, while in practice the asbestos filling has been generally adopted, the fact remains that it is but an improvement upon the basic discovery of Claude & Hesse, and in no wise impairs their claim to recognition as original inventors."

The following also is pertinent to this point from the affidavit or Mr. O. H. Skinner in this case (T. R., p. 437) (italics ours):

> " Criticism has been constantly directed at the Claude & Hess gas package without the asbestos disc, on the ground that such a package is dangerous and impracticable and that this is so because above the solution free acetylene forms in a highly compressed state and acetylene in this condition is dangerous. I deny this on theory and from practical experience and from my knowledge of the practical use of these packages.

" The word 'dangerous' is a relative term. Under some circumstances a fish bone may be dangerous. The gas package without the asbestos disc under the conditions hereinbefore related would be only dangerous in contact with live heat. That is, over a temperature of 1,400 degrees Fahrenheit. In case of fire in a garage or upon an automobile these packages would be liable to explosion and consequences resulting therefrom.

" However in ordinary use no such result could or has ever occurred from use of these packages with a pocket containing free compressed acetylene. The normal temperature at which they are used in practice never exceeds 100 degrees Fahrenheit. At this heat there is no possibility of any explosion of disastrous results.

" Prior to January, 1909, The Prest-O-Lite Company had put out *over forty thousand of these gas packages* and the Avery Portable Lighting Company *sixteen thousand thereof,* all of which were fitted with asbestos wicking, which, through the action of the liquid acetone sagged and left large free spots at the top of the disc. In use free acetylene under large compression collected in these packets and the same condition existed there as would be found in the Claude & Hess gas package without the asbestos discs as described in defendants' affidavits. In my experience, which dealt with such matter, none of these Prest-O-Lite and Autogas tanks exploded except when subjected to live heat such as fire or live sparks, and they were in continuous use for over three years. On account of danger from automobile fires and train wrecks, by agreement with the Bureau of the Railroad Transportation we framed an ordinance compelling the use of solid asbestos discs to remove even this possibility of disaster.

" These Prest-O-Lite and Autogas tanks, in the condition which I have just described, were in constant use and were being transported constantly up to the time these asbestos discs [wickings] were removed, and it was upon their experience that the present popularity of the Prest-O-Lite gas tank was founded. That is, from

twenty thousand (20,000) the sale has leaped to four hundred thousand (400,000).

"Moreover, in my laboratory practice I constantly employ the Claude & Hess package without the asbestos disc in experiments with heat, and I have fully verified my statements hereinbefore set forth. That is, unless the package comes in contact with live heat at a temperature of over 1,400 degrees Fahrenheit there is no possibility of disaster.

"Moreover, of my own knowledge, I know that the United States Government employed in buoy service the said Prest-O-Lite package without the asbestos packing and no accidents or disaster (-as) ever resulted from its use, but on the other hand their experiments had been uniformly satisfactory.

"The asbestos disc or package is solely an improvement upon the Claude & Hess gas package and removes the risk of explosion in live heat and also enables the package to be used upon automobiles where there otherwise would be a slopping of the contents through the valve in use. These asbestos discs serve the purpose of holding the supersaturated solution away from the mouth outlet, and for that purpose forms the function of the diaphragm in the Claude & Hess patent drawing."

(c) *The apparatus invention as a whole is not a mere double use of prior art:*

As shown hereinabove, the prior art did not meet this Claude & Hess invention. Says Judge QUARLES in *Commercial Acetylene Co. vs. Avery Portable L. Co. (supra)* at page 910:

"Prior to the discovery of Claude & Hess, acetylene was a well-known illuminant. Its brilliancy was appreciated. The simplicity and cheapness of its production had attracted general attention, but its explosive nature had put a ban upon its use. Every expedient to compress it for the purpose of transportation failed, and in many instances had been attended with disaster.

As Prof. Hallock testifies:

> "'Prior to the introduction of the tanks referred to here in suit, the use of acetylene was practically restricted to those cases where it could be immediately generated at the time and place where it was to be used.'

"The principle in physics that all gases were soluble in liquids was well understood. What is known as 'Henry's Law' had been familiar for a hundred years, that, broadly speaking, the quantity of gas that a liquid would absorb depended upon the pressure under which it was introduced. These general principles had been already embodied in commercial packages containing water charged with ammonia gas, and beverages charged with carbonic acid gas, etc. But it seems evident that these primary laws and their former crude embodiment did not and could not lead to the discoveries brought to light by Claude & Hess."

None of the prior art devices as a whole are appropriated by petitioner. The device of the patent in suit is so appropriated.

(*d*) *The patent is not for an aggregation:* None of the elements making up the combinations of any or all of the claims in suit performs the function nor accomplishes the result of the combination as an entirety. Each element of the combinations of these claims performs its part in accomplishing the result and all co-operate, each in its more or less important way, to achieve the patented result. Under these circumstances, cases cited on the point of aggregation are not controlling because the facts therein were different from the facts in this case.

(*e*) *Defendant's needle valve is the equivalent in defendant's device of the reducing valve of the patent in suit:*

On this point reference may be made again to the decision

in *Commercial Acetylene Co. vs. Avery Portable L. Co. (supra)* at page 912:

"This brings us to the main issue of infringement. The theory of the defendant is that, this being a combination of old elements, the defendant escapes infringement by omitting either of the essential elements in the combination. It is claimed that the defendant's drawings of Claude & Hess. In the specifications, line 97, this valve is described as 'a reducing valve, *d*, of any suitable or usual construction.' This valve has also an adjusting stem, d^5, which required manual adjustment and controlled the caliber of the outlet. The first question here presented is whether the inventors are to be confined to the details of this description, or whether it is to be looked upon within the ordinary rule of preferable method.

"It is practically conceded that the defendant has appropriated every other feature of the Claude & Hess device and seeks to differentiate his machine by the use of an outlet-valve of different construction. The defendant employs at the outlet what is called a 'needle-valve', which will be hereafter particularly described. That Claude & Hess are not limited to the specific valvular construction shown in the drawing is so conclusively established by the reasoning of the Court in the Paper Bag Case, 210 U. S., 405, 419, 28 Sup. Ct., 748, 52 L. Ed., 1122, that we dismiss the point by a simple reference to that case. The settled principle of law is that the invention is to be measured by the claims. Let us then proceed to consider the claims.

"The language of the first claim is—

"'means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure.'

"It is evident that the needle valve of defendant infringes this broad claim, if the gas escapes therethrough 'at substantially uniform pressure.' It is desirable to obtain a clear understanding of this needle

valve. Mr. Little, one of the complainant's experts, gives the following description:

"'These valves are of the sort known as "needle valves", in which, relative to the diameter of the aperture, the seat is very long and the valve stem is tapered down to a fine, acute point, which construction is well known to permit of an exceptionally nice and accurate regulation of the amount of gas passing through the valve. The orifice created by raising the valve after the manner followed in practice is so minute that the friction of the gas passing through is great and its rate of discharge substantially uniform over long periods. As a result, under the conditions of practice, the substantially uniform and slight pressure necessary for the proper combustion of the gas at the burner tips is similarly maintained, the gas pressure on the tank being through the action of the valve continuously and regularly reduced to the burner pressure, as I have proved by experiments of my own.'

"Mr. Little further testifies:

"'The fact is simply that Avery and everybody else found almost at once, as indeed will appear to any one upon a mere inspection of the conditions, that this old device—that is, the well-known needle-valve—would secure such a substantially uniform pressure as is required by the patent, and that therefore such structure infringes claim 1.'

"Mr. Fremont Wilson, a consulting engineer of large experience, sworn on behalf of the complainant, testified in substance that the needle valve is constructed and used to reduce and regulate the flow of gas or liquids, and that this is its only function, and that in actual practice a substantially uniform pressure is secured thereby.

"Prof. Haines, the expert for defendant, admits that claim 1 is broader than the other claims—

"covering, as one of its elements, a reducing-valve or any other device that may perhaps be discovered for producing the same effect as a reducing-valve.'

"The logical result of his testimony is to read the description into the claim; but his concession as to some equivalent yet to be discovered may well apply to an old element that practically discharges the functions of the so-called 'reducing-valve.'

"But to my mind the actual tests which were made with this needle valve on tanks of defendant are of greater value than the opinions of expert witnesses. Prof. Hallock in his testimony described numerous tests ranging from 5 to 21 hours, with different pressures ranging from 5 to 15 atmospheres, all of which demonstrated that the needle valve in practice did maintain a substantially uniform pressure, and that the light was as bright and satisfactory at the end of such tests as at the beginning. No proof was offered by defendant to question the correctness of his conclusions. But what is still more convincing is the combined experience of the myriads of users of these packages, who are illuminating every road and thoroughfare of this country. It is in evidence that the Prest-O-Lite Company, one of the licensees of the complainant, uses the needle valve, and that this one company has equipped more than 20,000 automobiles with this gas package. If the needle valve did not furnish substantial uniformity in pressure, the present popularity and success of gas tanks so equipped could never have been reached. So that we have the opinion of competent experts produced by the complainant, corroborated by careful tests made in the laboratory and confirmed by general use and experience of the gas package. So that I feel constrained to hold that the needle valve infringes the first claim of the patent in suit.

"Claims 2 and 5 stand upon a somewhat different footing. This being a combination patent, and the inventors having in these two claims designated a 'reducing-valve' as an element, are bound thereby, and, if the defendant dispenses with any reducing-valve or equivalent structure, it does not infringe. Fay v. Cordesman, 109 U. S., 408, 420, 3 Sup. Ct., 236, 27 L. Ed., 979.

"We are thus confronted with the question whether the needle or throttle valve of defendant is a 'reducing-valve' within the meaning of the claims. This is a question of fact to be determined by the evidence. As illustrating this claim, we go to the specifications and find that the inventors say:

> "'This reducing-valve may be of any suitable or usual construction.'

"And further they say:

> "'It is not intended to limit the invention to the specific construction herein shown, since modifications may obviously be made.'

"Four experts called by the defendant treat the expression 'reducing-valve' as a technical term, which they say means an automatic valve; and Prof. Haines contends that a valve is not entitled to be called a 'reducing-valve' although it does in fact reduce or regulate the pressure, if it is manually regulated. He admits that he uses the term 'quite independently of the meaning of the two words comprising the term.' He cites two dictionaries that give a definition that favors his construction; but the dictionaries do not agree, because Mr. Little refers to the Standard, which is of no equal authority, and the definition there is practical and not technical, and omits entirely the automatic feature.

"We now pass to complainant's testimony. Prof. Hallock interprets this term according to its natural popular significance:

> "'A reducing-valve is a form of valve which in general enables the operatar to produce a smaller pressure upon one side of the valve than upon the other.'

"After examining the needle valves in evidence, he testified in substance that this valve may properly be defined as a 'reducing-valve,' and that, as applied to defendant's tank and its requirements, this valve is a reducing valve.

"Mr. Arthur Little, who is at the head of the largest commercial laboratory in the country, with great experi-

ence as chemist and engineer, among other things testified:

"'All that an automatically acting pressure regulating-valve could possibly accomplish if set in place upon defendant's package, and all that any one would expect of it, would be the maintenance of a substantially uniform pressure in the pipe beyond the valve. Defendant's valve does exactly this, and under the conditions of use does it just as well as the most complex type of automatically-acting pressure-reducing valve could do it. The reason is simply that the predetermined conditions are such that the automatic feature of an automatically-acting pressure-reducing valve would not be called into play to any extent which could be recognized during any period of use, because, on the high side of the valve in such a package, there is a sustained and nearly uniform pressure which is several thousand times greater than the pressure on the low side of the valve; and this pressure itself is for a long time automatically sustained as the solvent gives up its gas to restore the equilibrium disturbed by the passage of gas through the valve orifice. Defendant's valve is, therefore, under these conditions and for the required period of use, just as much and just as properly a reducing-valve, whether in the literal sense in which the term is used by Prof. Hallock, or in the special sense given to it by Prof. Haines, as any automatically-acting pressure-reducing valve could be. This being true of the things concerned, it seems to me that the mere form of words affords Prof. Haines no escape from my own conclusion—that defendant's structure does in fact include a reducing-valve and a very efficient and thoroughly satisfactory one. For these reasons, it is my opinion that defendant's structure is the structure contemplated and described in claim 2 of the Claude & Hess patent in suit, and is fully covered thereby.'

"Mr. Fremont Wilson, who has had large experience in installing light plants, specifies two specific instances which came under his own observation, where tanks of large size were installed without any automatic reducing-valve. One of these was on Governors Island in New York Harbor, where he illuminated the barracks for a full-dress ball from 8 p. m. until 2 a. m. with 40 or 50 burners, and that the valve worked satisfactorily and was not disturbed throughout the entire evening. He states that, while the candle power had decreased, the brilliancy of the flame remained, and the guests never knew the difference.

"I regard it as unnecessary to pass upon the precise point so vigorously discussed by experts, because whether the needle valve is, within the meaning of the claim, a 'reducing-valve,' it clearly is an equivalent for the valvular construction shown in the application, within the field of alleged infringement. The needle valve was well known when the patent in suit was granted. In the tanks of defendant it discharges all the functions of the manually regulated outlet valve and of the diaphragm suggested in the Claude & Hess drawing."

Mr. Theodore W. Smith, for complainant, says in his affidavit (T. R., p. 16) that petitioner's apparatus contains—

"a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent."

Mr. Oramel H. Skinner states in his affidavit for respondents (T. R., p. 17), in speaking of petitioner's apparatus—

"This valve is a reducing valve and is the same valve as that attached to the Prest-O-Lite gas tank and the Autogas tank which was manufactured by the Avery Portable Lighting Co. in Milwaukee (Defendant in the case of *Commercial Acetylene Co. v. Avery Portable D. Co.*, 166 F., 907).

Mr. Skinner also, in further discussing this matter at T. R., p. 436, states as follows:

> "For this purpose the needle valve used by complainants and defendants is just as much a reducing valve and serves as much for this purpose as the most highly organized and complicated automatic pressure valve known. Furthermore, the other function performed by this valve is that of supplying gas which passes therethrough at substantially uniform pressure for the required periods of use so that the illumination caused by the combustion of the acetylene at the burner will be constant and non-fluctuating."

Also (T. R., p. 437) as follows:

> "In the condition of use in the Prest-O-Lite and Fireball gas tanks on automobiles, the amount of gas used does not vary. It is constant. That is,—one cubic foot of gas per hour must be delivered by the package at substantially uniform pressure. The longest possible continuous use that these packages require never exceeds over eight burning hours. I have proved by constant experiments both in actual practice and in the laboratory that the needle valve on a Prest-O-Lite tank produces this. Moreover, the usual length of a continuous run called for in these gas packages very rarely exceeds four continuous hours."

Also, Mr. F. W. Russe, for petitioners, at T. R., p. 441, as follows:

> "The valve attached to the outlet at the end of the said Fire Ball Gas Tank I found by test served as a means of controlling the said outlet whereby the acetylene might escape therethrough at substantially uniform pressure. This I found by actual experiment."

Also, Mr. F. E. Gallagher, for respondents, at T. R., p. 450:

> "Despite the fact that the period of illumination was several hours longer than would usually be de-

manded in an acetylene lighting system, the reduction of pressure in the tank has not resulted in a very serious decrease in the illuminating power of the flame. The diminution in the size of the flame over a two-hours' discharge period is scarcely noticeable. From this it would therefore appear that the valve used on the Fireball tank serves quite efficiently as a reducing valve and maintains a fairly uniform rate of discharge over a reasonable interval of time."

(*f*) *In general:* Under different ways of putting it and under differently phrased headings in the petitioner's brief, attack is made on the fundamental patentability of the Claude & Hess discovery. These attacks have no substantial merit. Similar attacks were made in the case of *Commercial Acetylene Co. vs. Avery Portable L. Co.* (*supra*). Judge QUARLES in that case referred to them as indicated from the following quotations (p. 910):

"The second issue is the patentability of the invention. It is contended that no invention is disclosed by Claude & Hess, but that in view of the state of the art, their alleged discovery involves merely mechanical skill.

"Time and space preclude a review of the learned and interesting discussion of expert scientists preserved in the record as to Henry's Law with its many variations, of the general knowledge of the solubility of all gases in liquids, and the conclusions that might be naturally drawn therefrom by one skilled in the art.

"There is one feature of the Claude & Hess discovery which is of paramount importance, namely, the peculiar affinity of acetone for acetylene, and especially the modifying influence of each upon the other when combined in a supersaturated solution. Acetone is volatile and inflammable, and its vapor when mixed with air is explosive. Acetylene is highly explosive. Defendant suggests no law of physics, or treatise, or source of information, that would have led to the discovery that both elements would become harmless when

so combined. Claude & Hess were the first to make known these peculiar and wonderful properties, which they must have discovered by actual experiment. This fact is attested by the literature of the art and by the testimany here adduced.

" Prior to the discovery of Claude & Hess, acetylene was a well-known illuminant. Its brilliancy was appreciated. The simplicity and cheapness of its production had attracted general attention, but its explosive nature had put a ban upon its use. Every expedient to compress it for the purpose of transportation failed, and in many instances had been attended with disaster. As Professor Hallock testifies :

> " ' Prior to the introduction of the tanks referred to here in suit, the use of acetylene was practically restricted to those cases where it could be immediately generated at the time and place where it was to be used.'

" The principle in physics that all gases were soluble in liquids was well understood. What is known as ' Henry's Law ' had been familiar for a hundred years, that, broadly speaking, the quantity of gas that a liquid would absorb depended upon the pressure under which it was introduced. These general principles had been already embodied in commercial packages containing water charged with ammonia gas, and beverages charged with carbonic acid gas, etc. But it seems evident that these primary laws and their former crude embodiment did not and could not lead to the discoveries brought to light by Claude & Hess. It was by patient experiment that they learned that acetone under a pressure of 12 atmospheres would absorb acetylene to the extent of 300 times its own bulk ; that when combined in solution, these inflammable and explosive substances would tolerate the introduction of a platinum wire heated to a white heat, without explosion ; that such mixture would not freeze, and was not corrosive ; that the two substances were miscible at all temperatures ; and that, if a small quantity of the solvent escaped with the gas, it would not retard combus-

tion. In short, Claude & Hess were the first to discover a practical and safe method of storing and transporting these dangerous substances—a consummation long sought and one of transcendent importance. They devised means for putting a valuable and cheap illuminant within easy reach of the general public. It was not necessary for them in their application to elaborate the scientific theories underlying their invention. Dixon-Woods Co. v. Pfeifer, 55 Fed., 395, 5 C. C. A., 148; Eames v. Andrews, 122 U. S., 40, 7 Sup. Ct., 1073, 30 L. Ed., 1064; Warren Steam Pump Co. v. Blake (C. C. A.), 163 Fed., 263; Hogan v. Westmoreland Co. (C. C.), 163 Fed. 289; Cleveland Foundry Co. v Detroit Co., 131 Fed., 853, 68 C. C. A., 233.

"It is a cheap and easy thing to say, after the fact, that any skilled chemist might have arrived at the discovery by application of well-known physical laws. There are comparatively few patents that could escape this plan of attack. The avidity with which this discovery has been adopted for commercial purposes, the safety and success that have attended its introduction, attest its great utility. It appears that one of complainant's licensees has already equipped over 20,000 automobiles with this gas package. If we are to calculate the utility of the invention by the number of persons who are enjoying its benefits, it would easily take its place in the front ranks of recent discoveries."

Says Mr. Theodore W. Smith, for respondents (T. R., p. 13):

"The preferred solvent used in connection with, and as one of the elements of, this gas package, and as Claude & Hess discovered, the preeminently useful one is acetone, which at the moderate pressure of 12 atmospheres dissolves 300 times its own bulk of acetylene as Claude & Hess first showed."

Also at T. R., page 16, says Mr. Smith:

> "I will not attempt to detail the great improvement in the chemical art of the discovery of Claude & Hess dissolved acetylene. This is a matter of common knowledge now and is commented on by such authorities on acetylene as Lewes and Leeds & Butterfield. This discovery of Claude and Hess of the affinity of acetylene and acetone resulted in their further invention of the gas package described in the letters patent in suit, *i. e.*, the discovery of dissolved acetylene enabled Messrs. Claude and Hess to invent the wonderful apparatus which is now in use in automobiles and known as an acetylene gas tank."

Mr. O. H. Skinner, for respondents, also refers to this matter at T. R. page 438, as follows:

> "The fundamental discovery which made the Claude & Hess package possible was the discovery of the enormous value of acetone as a solvent of acetylene and the remarkable affinity of this gas under pressure to this liquid. That is, the solvent value of acetone is twenty-five times its own volume at atmospheric pressure whereas the next highest value of any liquid is that of alcohol, which is six times its own volume at atmospheric pressure. This discovery of Messrs. Claude & Hess is recognized by all of the well known authorities on acetylene including Lewes and Leeds & Butterfield, who uniformly ascribe to Messrs. Claude & Hess this discovery. It is this remarkable affinity of acetylene to acetone that makes the Claude & Hess package valuable as a lighting apparatus, and has rendered commercial a dangerous gas such as acetylene."

(*g*) *There was no abandonment of the invention of Claude & Hess by their failure to prosecute further the method application and their abandoning that application:*

This point is clearly stated in the opinion of the Circuit Court of Appeals for the Sixth Circuit in *Acme Acetylene Co.*

vs. Commercial Acetylene Co., 192 F., 321, quoting from page 325:

"Claude & Hess filed two applications at the same time in the United States Patent Office; one for a method patent and the other for an apparatus patent—the patent in suit. The application for the method patent was rejected and abandoned. It was contended in the court below and is here, that the abandonment of the method application in practical effect operated, despite the fact that the other application was granted by the Patent Office, also to abandon the apparatus application. Judge DENISON said of the two applications (C. C.), 188 Fed., 90:

"'They were complementary to each other. The inventions were correlative. One sought to patent an apparatus which employed the method, and the other sought to patent the method which employed the apparatus.'

"And after stating, 'It is now urged that thereby the main idea, the "soul of the invention," was abandoned to the public,' he proceeded *(ibid)*:

"'I do not so understand the rule. The two things, method and apparatus, are distinct inventions. They may be patented by separate patents. The apparatus applicant may apply for the method, or he may not, as he chooses. If he appli s for both in separate applications he may change his mind, and withdraw or abandon either without affecting the other. The doctrine of the cases upon which defendants rely is that acquiescence in the rejection of a claim and acceptance of a grant with other claims estop the grantee from construing the grant as if it contained the claim rejected. This doctrine cannot apply to negotiations which did not mature into the grant of anything. The references and arguments which had more or less effect in inducing the abandonment are now important, not as an estoppel but only on their

merits; and on their merits they have been considered in the former decisions.'

"So far as the abandonment of the method application and any effect that such abandonment could have upon the apparatus application and patent are concerned, the statement of law just quoted is so manifestly sound and so in accord with principles laid down in the Leeds & Catlin Case (213 U. S., 301, 318, 29 Sup. Ct., 495, 53 L. Ed., 805), that the contention made in respect of abandonment may safely be passed without further notice."

(*h*) *The bill should not be dismissed at this* hearing unless of course as a matter of law on the face of the documents without testimony as to facts the Court should hold that the patent in suit had already expired at the time of the filing of the bill. We submit that the showing made as to patentable novelty, infringement and other matters is sufficient to sustain the patent and the Bill. It is to be said, however, that particularly as to the matter of the discovery by Claude & Hess and the acknowledgment accorded to that discovery by the literature of the art, the evidence in this case is not amplified to the extent that it was in the cases that went to final hearing, nor to the extent that it would be on final hearing in this case, reliance having been placed on the adjudications as to that matter that preceded the preliminary injunction herein.

The Invention of the Patent in Suit.

The patent we are discussing patents a real invention. While the physical laws applying to the solution of gases in liquids had been in general known, it was the patentees that disclosed the specific laws and the specific utilities of certain liquids, particularly acetone, as solvents for acetylene. Respondents' record in this case is not as full as it was in cases that went to final hearing, because at the time that this suit

was instituted, reliance was particularly placed on prior adjudications sustaining the patent and the invention. Nothing was introduced in this record of a sufficiently certain and definite character to overthrow those decisions.

A little as to the defects of the prior art of acetylene storage and distribution is outlined in the specification of the application of Claude & Hess U. S. process patent as appears at T. R., page 260, and some of the special advantages of acetone as a solvent are briefly set forth in that same paper at T. R., page 261. To directly generate the gas by the use of carbide and water for direct use from the generator was used to some extent. It does not foreshadow the discovery of the patent in suit. Mere storage of the gas in the tank, even with the regulator, was not generally practical, for many reasons, among them that one could not get volume enough of gas as gas in the tank. To compress the gas into a liquid and therefore increase the gaseous capacity of the tank was tried according to many methods and according to divers apparatus. That, however, proved unsatisfactory and dangerous. The patentees' discovery, however, has proved safe, practical and astonishingly useful. Many infringers want it because it is so safe and useful. It has proved so safe and useful that it has become the standard. Transportation companies accept transport of it. The government uses it to light buoys, etc. Over 400,000 (T. R., p. 13) of these Prestolite tanks had been sold as far back as August, 1911 (T. R., p. 16). Improvements had been made over the specific apparatus which the patent in suit discloses. All these improvements embodied the Claude & Hess discovery and the basic invention of the patent in suit.

The literature on the subject and the ascribing of the merit of the discovery to Claude & Hess is not full for respondents in this record. It is merely stated as existing in some of respondents' affidavits.

A full review and appreciation of the work of Claude &

Hess in this art is contained in the opinion of the then Circuit Court in *Commercial Acetylene Co. vs. Avery Portable Lighting Co.*, 166 F., 907, 910, *et seq.*, to which opinion in its entirety as to this point, reference is respectfully made.

Conclusion.

We respectfully submit:

FIRST. The term of the patent in suit should be held not to be limited by the terms of any of the foreign patents referred to and the patent in suit should be held to be now in full force and effect.

SECOND. The patent in suit should be held to be infringed by defendants.

THIRD. The patent in suit should be held valid and as disclosing patentable novelty and not anticipated.

FOURTH. The Bill should not be dismissed.

Respectfully submitted,

JOHN P. BARTLETT,

Of Counsel for Respondents.

FIREBALL GAS TANK & ILLUMINATING COMPANY *v.* COMMERCIAL ACETYLENE COMPANY AND PREST-O-LITE COMPANY.

CERTIORARI TO THE CIRCUIT COURT OF APPEALS FOR THE EIGHTH CIRCUIT.

No. 13. Argued October 22, 1915.—Decided November 29, 1915.

A process may be independent of the instruments employed or designed to perform it, and the expiration of a foreign patent for the one may not affect the United States patent for the other.

In this case *held* that the patent of complainants for acetylene gas tanks is distinctly for an apparatus while the foreign patents which have expired and are claimed by defendant to be identical are explicitly for methods.

There having been conflicting opinions of different Circuit Courts of Appeal on questions of invention and infringement as well as the effect of expiration of foreign patents *held* that there was no abuse of discretion in the granting of an interlocutory injunction, but that while there is no identity between complainants' patents and expired foreign patents pleaded by the defendant, all other questions should be reserved for the trial of the cause.

THE facts, which involve the propriety of issuing an interlocutory injunction in a suit for infringement of patents for acetylene gas apparatus, are stated in the opinion.

Mr. John H. Bruninga for petitioners.

Mr. John P. Bartlett for respondents

MR. JUSTICE MCKENNA delivered the opinion of the court.

By this writ there is brought here for review a decree of the Circuit Court of Appeals affirming an order for an

interlocutory injunction against the infringement of certain letters patent.

The Circuit Court of Appeals considered the question in the case to be the narrow one whether the injunction was properly granted.

Petitioners, who were defendants in the District Court, attack not only that conclusion but contend for the larger relief of a dismissal of the bill.

The Acetylene Company is the owner of letters patent No. 664,383 granted December 25, 1900, for "apparatus for storing and distributing acetylene gas." The Prest-O-Lite Company is the exclusive licensee as to the use of the invention on automobiles, carriages and other movable vehicles. Defendants manufacture and sell what is known as the "Fireball Gas Tank"; Soloman is the president of the defendant.

The bill was filed August 17, 1911, and a motion for a preliminary injunction was made. It was heard upon the bill, exhibits, answer, replication and affidavits. The Circuit Court granted the injunction and the order was affirmed, as we have said, by the Circuit Court of Appeals. The court considered that the question before it was whether the trial court had exercised a sound judicial discretion in granting the injunction, and deciding that the trial court had done so, affirmed its action and refused to dismiss the bill, as it was urged to do. Opinion was reserved upon all of the questions which the record presented except the question of the abuse by the trial court of its discretion in the issue of the injunction, as the court said, "until the affidavit stage of this proceeding shall have been passed, until the rights of the parties shall have been tested by the production, hearing and cross-examination of their witnesses according to the salutary and searching practice of the common law, and until the court below, at the final hearing, has investigated and decided the issues these parties raise in

the light of that testimony and of the argument of counsel."

Whether this prudence should be imitated or a broader scope of decision be made we will determine upon a consideration of the case.

The bill is in the usual form and set forth the respective rights in the patent of complainants, respondents here (we shall refer to them as complainants and to petitioners as defendants), and its infringement by defendants.

The defendants answered separately and each denied infringement and averred that by reason of the proceedings in the Patent Office the patent is limited in its scope to the subject-matter precisely as claimed and defined by the claims of the patent; that the prior art was such that the patent is devoid of novelty and patentable invention; that it is destitute of utility; that it does not comply with the statutes in precise difference from what preceded it, nor sufficiently describe the method of operating it and the process of making, constructing and using it; that complainants have a remedy at law and the court has no jurisdiction; and that the alleged inventors of the patent were not the first and true inventors of it. Certain United States, British and German patents are alleged as ante-dating the invention and certain publications are represented as having disclosed it.

Public uses of the patent are also circumstantially alleged and profits are denied. It is further alleged that the invention of the Claude & Hess United States patent No. 664,383, which is in suit, was patented to George Claude and Albert Hess by British patent No. 29,750 and that the latter had expired or ceased before the issue of patent No. 664,383; that the term of the latter expired not later than June 30, 1910; that a French patent to the same patentees expired June 30, 1911, and that therefore patent No. 664,383 also expired not later than said date; and so with the German patent and other patents.

The first consideration which presents itself is the identity of the United States patent with the foreign patents which by their expiration, if they have expired, have terminated the United States patent.

The letters patent in suit describe the invention as "An Improvement in Apparatus for the Storage and Distribution of Acetylene Gas." Drawings illustrate the patent, and it is stated that it "is designed to carry out a process of storage and distribution involving the employment of a chamber charged with a solvent of the gas to be stored and into which the gas is forced under suitable pressure," and that the apparatus is to be charged at a central station and transported to the place of use as a complete article or package. The apparatus is described and illustrated and it is said that it, embodying the invention, consists essentially in a closed receptacle containing acetylene gas in solution and having an outlet for the gas so positioned as to be normally above the level of the solution and adapted to be provided with a burner or connected with a pipe system for the final use or distribution of the gas which escapes from the solution owing to the diminution of pressure when the outlet is opened. It is constructed and arranged "for the charging process as well as for the discharging process." Inlet and outlet passages are provided with suitable valves or cocks to close the same, and it is desirable, it is said, for the proper operation of the burners supplied in this way that the gas should be delivered thereto under a substantially uniform pressure only slightly above the atmospheric pressure, and for this purpose means are provided. A reducing valve is shown as the means interposed between the interior of the receptacle which contains the dissolved gas and the outlet from which the gas is allowed to escape.

Claims 1, 2 and 5 are those with which we are concerned, and are as follows:

"1. A closed vessel containing a supersaturated solu-

tion of acetylene produced by forcing acetylene into a solvent under pressure, said vessel having an outlet for the acetylene gas which escapes from the solvent when the pressure is released or reduced, and means for controlling said outlet whereby the gas may escape therethrough at substantially uniform pressure, substantially as described.

"2. A prepared package consisting of a tight shell or vessel; a solvent of acetylene contained within said vessel; and acetylene dissolved in and held by said solvent under pressure and constituting therewith a supersaturated solution, the package being provided at a point above the solvent with a reducing valve, substantially as and for the purpose set forth.

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"5. As a new article of manufacture, a gas package comprising a holder or tight vessel; a contained charge of acetone; a volume or body of gas dissolved by and compressed and contained within the solvent; and a reducing valve applied to an opening extending to the interior of the holder above the level of the solvent, substantially as set forth."

It is manifest, therefore, that the invention is of an apparatus designed to make use of the property of acetylene and other gases of solubility in a liquid in accordance with the law of solution (Henry's law), which is that the amount of gas absorbed by any liquid is proportioned to the pressure exercised upon the gas. Acetone is mentioned in claim 5 as a solvent.

We may now turn to the various patents whose expiration, it is contended, terminates the United States patent.

The law is (Rev. Stats., § 4887) that "every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be

more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years."

The question then is one of identity between the United States patent and the foreign patents. The first of the latter relied upon is the British patent to Claude and Hess of 1896. The title is "An Improved Method of Storing Acetylene for Lighting and Other Purposes." The specification states:

"This invention relates to an improved method of storing acetylene, for lighting and other purposes, in a small volume in order that it may be supplied in portable form to the customer, and it consists in dissolving the acetylene under pressure in certain liquids, the effect of pressure being to increase the solubility of the acetylene and so enable a considerable quantity of acetylene to be stored in a small volume in readiness to be supplied for any purpose for which it may be required.

"Liquefied acetylene occupies the least volume but the pressure is very high and may become excessive should the critical temperature (37° .5) of acetylene be accidentally exceeded. On the other hand simple compression of the gas enables dangerous pressures to be avoided, but the quantity which can be stored in this way is too small. For these reasons we avail ourselves of the great solubility of acetylene in certain liquids, and increase this solubility by pressure, and this method of storing acetylene gas is the Invention which we hereby broadly claim as our Invention, whatever may be the liquid employed, the kind of apparatus used, or mode of operation."

Examples of liquids which may be employed as solvents are given. Among these are methyl and "alcohols" and "particularly acetones." It is stated that mixtures and combinations of these bodies vary their solvent power, and of this property the patentees said they availed themselves. And further that the solvent power increases with

pressure and the solution of the gas in a liquid is the principle of the invention.

The process described as carried on, though subject to modifications, is as follows: the gas is dissolved in the liquid chosen and the "solution under pressure, however obtained, is filled into a receiver of metal or of glass (such as used for soda-water) capable of resisting the pressure employed. The receiver has a cock and the necessary adjuncts for connection, directly or through an expansion chamber, with the appliances in which the gas is used by the consumer, the substitution of charged for empty receivers being readily effected. The storage receivers may vary in dimensions from a small portable, to a large fixed gas-holder."

The claims describe the method and invention to be the utilization for the purpose of storage, in a small volume, of large quantities of acetylene gas, of the solubility of the gas in certain liquids by the application of pressure and the novel application as a solvent of acetylene under pressure for the purpose of storage, transportation, and utilization for industrial purposes; and the employment (claim 6) of a receiver containing a liquid charged with acetylene under pressure and from which the acetylene is evolved when required for use.

Defendants have fixed on claim 6 as establishing identity, and the British law of patents is relied on. *British United Shoe Machinery Co.* v. *Fussell & Sons, Ltd.*, 45 P. R. C. 631. The argument is that not only a receiver is claimed but a receiver of the exact or equivalent kind described in the United States patent. Counsel say: "Evolving gas from a receiver in which the gas is under pressure necessarily implies an outlet, an outlet necessarily implies a valve and a valve necessarily implies a control of the escaping gas." They say further, quoting the cited case: "'A man must distinguish what is old from what is new *by* his claim, but he has not got to distinguish what

is old from what is *new* in his claim.'" Applying the principle and asserting that the devices described in the United States patent were old it is contended that they would be implied as necessary elements of the claim.

Taken at its full import the argument would seem to establish that there could be no patent for an apparatus to execute a process if it (apparatus) were a combination of old elements. In many cases, therefore, the argument would confound process and apparatus, but it is established that a process may be independent of the instruments employed or designed to perform it. They may be independent or they may be related. "They may approach each other so nearly that it will be difficult to distinguish the process from the function of the apparatus. In such case the apparatus would be the dominant thing. But the dominance may be reversed and the process carry an exclusive right, no matter what apparatus may be devised to perform it." *Steinmetz* v. *Allen*, 192 U. S. 543, 559. However related they may be, to which may be assigned dominance may be important in considering the patentable novelty of either or, it may be, the infringement of either, but not whether one has expired because the other has. *Leeds & Catlin* v. *Victor Talking Machine Co.*, 213 U. S. 301, 318. The various questions thus arising may indeed have complexity (*Risdon Locomotive Works* v. *Medart*, 158 U. S. 68), but they must not be confounded.

A great deal of what we have said applies to the German patent. Its claim is for "the employment of liquids charged with acetylene under pressure for the purpose of utilizing acetylene for illumination, motive power, heating and the like, characterized by acetylene being absorbed under pressure by a suitable liquid and the liquid saturated with acetylene being preserved or contained in suitable vessels, from which the acetylene gas can be supplied for use, a pressure regulator being preferably interposed."

This claim is preceded by a lengthy explanation (too lengthy to quote) setting forth the properties of acetylene and its absorption by certain liquids and the dependence of the amount of absorption upon pressure and the use of such properties and pressure for storing and utilizing the gas. It is said, "The vessels for holding the liquid saturated with acetylene must be provided with a cock or valve from which the gas escapes according to the diminution of pressure which occurs, and can then be used for the customary purposes." And an apparatus is described, "with whose aid the storing process can be carried into practice." Care is taken to mention "that the process is in no way limited to the apparatus described and shown." It is clear, therefore, that the process and the described vessel of storage are separate and that the invention is for the former. An apparatus was mentioned in display of the utility of the process. See *Tilghman* v. *Proctor*, 102 U. S. 707. It was not the intention to claim a particular form of device and secure a patent for it.

The title of the French patent is "A System of Storing Acetylene." And it is said that the object of the "invention is a system of storing acetylene whereby acetylene to be used for any purpose whatsoever, especially for lighting, may be enclosed in a restricted space and easily transported."

A description of the process is given and the properties of the gas and its solvent which make the law of the process. And it is said the solution under pressure obtained by the means described, "or by any other means, is placed in a metal recipient (or a glass recipient, like seltzer water siphons) susceptible of resisting the pressure employed. The recipient is provided with a faucet and the necessary fittings to enable it to be connected, either directly or by means of an expander, with the apparatus of consumption at the house of the consumer."

The claims were:

"1. For the storage of large quantities of acetylene in a small space, the application of the solubility of this gas in certain liquids, using pressure for the purpose of increasing the amount of gas dissolved per unit of volume of the liquid, as described above;

"2. For the purpose of effecting the solution under pressure of large quantities of acetylene in a small volume of liquid, the use of methods and apparatus employed to cause the solution under pressure of other gases in other liquids, especially of carbonic acid in water."

There were certificates of addition to the patent, the first of which sets forth the advantage of mixing the liquid with a porous body capable of absorbing it. "An expedient and practical form of accomplishing this" is set forth in the second certificate. The third certificate of addition connects the patent "with a safety appliance to be adapted especially on recipients where the acetylene is dissolved in an appropriated liquid, such as acetone, according to the process described in" the patent.

The contention is that the patent is for a "system," not for a "process or method," and that besides the "'Resumé'" or claims of the first patent especially refer to both "'method and apparatus'" and that "the certificates of addition, especially the last two, unquestionably are for the apparatus, namely, the gas tank."

We think the contentions are untenable. The distinction between system and method is too subtle, and, besides, it is clear that the patentee considered the words as meaning the same thing, and the apparatus referred to was one, it was said, "employed to cause the solution under pressure of other gases in other liquids." It was not the apparatus of the United States patent, though having some features the same.

But it is contended that even if considered as a 'method' patent, "it is merely for the method of operating the

apparatus, constituting the function of the apparatus, and, therefore, under the decision of this court, is for the same invention." And this is contended to be established by *Mosler Safe & Lock Co.* v. *Mosler*, 127 U. S. 354, and by a ruling of the Patent Office upon the application of Claude and Hess for an "Improvement in a Method of Storing Acetylene Gas for Distribution" and the acceptance of that ruling by the applicants.

The *Mosler Case*, it was said in *Miller* v. *Eagle Manfg. Co.*, 151 U. S. 186, 197, held "that a patent having issued for a product, as made by a certain process, a later patent could not be granted for the process which results in the product." The process was a purely mechanical process, and the ruling, it would seem, must be confined to the exact facts of the case, for in *Miller* v. *Eagle Manfg. Co.* it was said (p. 199) that "a single invention may include both the machine and the manufacture it creates, and in such cases, if the inventions are really separable, the inventor may be entitled to a monopoly of each." And *Sewall* v. *Jones*, 91 U. S. 171, 190, was cited for the purpose of showing that there might be a patent for the process and one for the product. *Merrill* v. *Yeomans*, 94 U. S. 568, was also cited (151 U. S., p. 199) as holding that "where a patent described an apparatus, a process, and a product, and the claims cover only the apparatus and the process, the law provided a remedy by a surrender of the patent and a reissue, for the purpose of embracing the product."

The ruling of the Commissioner of Patents referred to above is as follows:

"It was common long prior to the appellants' invention to force under pressure into a liquid solvent thereof in a closed vessel and was also common to draw off gas from a holder where it was contained under pressure, through an opening, the effective size of which was directly controlled by and proportionate to the pressure of the gas

within the holder, or, in other words, through a pressure regulator. The appellants were therefore not the inventors of the step of storing gas, as set forth, nor of the step of permitting gas to escape from a place of storage in the manner set forth. Neither of these steps modifies in any manner the old and expected effect of the other and the final result of the alleged process, namely, distributing gas at a uniform pressure, is the same as that produced by processes old in the art, as above stated. The appellants have therefore not invented a new and patentable process, although, as held in a companion case, they have devised an apparatus by which the old process of storing gas can be made practically and commercially useful. Claims to that apparatus have been allowed and it is believed that it is the only patentable invention disclosed by them.

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"It appears, further, that they do not cover proper methods, but merely the functions of mechanism and that they are not patentable in view of the decisions in *Cochrane* v. *Deener*, 94 U. S. 780, and *Boyden Brake Co.* v. *Westinghouse*, 83 O. G. 1067. Claim 3 clearly covers several independent disconnected steps which do not go to make up a patentable process."

The "companion case" referred to by the Commissioner is the patent in suit, and it will be observed that the Commissioner said it was for an apparatus by which the old process of storing gas could be made practically and commercially useful and that claims to it had been allowed. It was, therefore, distinctly a patent for an apparatus, while, on the contrary, all the foreign patents are explicitly for methods. The devices described in them were not a result of the operation of the methods. Some receptacle or apparatus was necessary to be shown to produce and hold the solution of the gas and the liquid employed as a solvent. Something else was necessary for